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FORMERLY
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(Original Official Organ U. S. Vet. Med. Ass'n)

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(Original Official Organ U. S. Vet. Med. Ass'n.)

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THE COLUMBUS CONVENTION

ALL of us were glad to have an opportunity to visit the capital of the great Commonwealth of Ohio, long renowned for the wisdom of the statesmen it has sent to Congress and famed as the producer of more presidential timber in late years than any other State in the Union.

Col. John Y. Bassell, Manager of the Columbus Conventions and Publicity Association, did not exaggerate when he told us at the New Orleans meeting last year that Columbus is a beautiful, prosperous city with ample facilities to meet our needs, that it has grown proficient through experience in entertaining conventions, and that it is her custom to extend splendid courtesy and hospitality to visitors within her gates. There were many things to make us feel that we were welcome in this important educational center with its great State University, the Veterinary Department of which ranks as one of the foremost institutions of its kind. The committee on arrangements deserve great credit and the gratitude of the Association for the careful preparations they made for our comfort and entertainment. It was a great advantage to have the use of such a centrally located and conveniently arranged building as Memorial Hall for a meeting place.

The program covered a wide scope and was exceptionally interesting. A notable feature was the appearance of so many new names, which is only one of the indications of the care and wisdom exercised in its preparation.

Meetings of committees began on Sunday, August 22. The Executive Board held several sessions in advance of the scheduled time for meeting, so that there would be no unnecessary delay at the general sessions in dispatching the business to be brought before the Association. Everywhere there were signs of preparation. Thus the Fifty-seventh Annual Meeting of the A. V. M. A. met in Columbus under the most auspicious conditions and the indications for a successful meeting were evident from the start. Approximately 500 members and 550 visitors, including ladies, were present, making one of the largest assemblages at any meeting of the Association.

Monday morning at 9:30 the members of the Association, their wives and friends, began to gather for the opening session, which was preceded by pipe-organ selections and community singing under the direction of Karl Hoenig.

President C. A. Cary called the meeting to order promptly at 10 o'clock. After the invocation by the Rev. Dr. Hargroves of Columbus the announcement was made that it would be impossible for the Mayor to be present and that Col. Bassell had suddenly been taken ill. The address of welcome was delivered by Mr. Hugo Schlesinger, Prosecuting Attorney for Franklin County, who ably represented the Mayor and Col. Bassell and was responded to in a pleasing address by Dr. George H. Glover. The President's address, which followed, was constructive and contains much material for careful thought. It appears in full in this number of the JOURNAL.

The afternoon session was devoted principally to hearing reports of officers and committees. In accepting the report of the subcommittee of the Executive Board the By-Laws were changed so that hereafter the Secretary of the Association and the Editor and Business Manager of the JOURNAL will be selected by the Executive Board and these positions may be held by one person. According to the Secretary's report, approximately 300 applications for membership have been filed and 15 members have been lost by death.

Dr. W. Horace Hoskins, chairman of the Committee on Legislation, gave an interesting review of the past work of that committee. He also called attention to the inadequate compensation of the large body of Bureau of Animal Industry veterinarians. In retiring from the committee he called attention in an impressive manner to the

important work that remains for future committees on legislation.

The President's reception Monday evening was among the most enjoyable occasions of the kind in the history of the organization. It was largely attended, and the spacious ball-room in the Deshler Hotel afforded splendid facilities for dancing and general sociability.

The convention got into full swing on Tuesday morning. The literary program was divided into three sections: General Practice, Sanitary Science and Police, and Faculties and Examining Boards. The attendance in each section was very good. The papers read were of a high order and showed much care and work in their preparation. Interest seemed to center especially around the papers and discussions on the subject of tuberculosis in connection with the accredited-herd work that is being conducted by the Bureau of Animal Industry in coöperation with the various States. The paper of Dr. L. A. Merillat on "The Veterinary Professions of the United States and France Compared" attracted special attention on account of the comparison which was not entirely favorable to the United States. Some of the papers were well illustrated by original stereopticon views.

The only nominees for President for the ensuing year were David S. White and A. H. Baker. Four hundred and forty-eight votes were cast, of which Dr. White received 325. The vice-presidential election resulted as follows: First Vice-President, A. O. Longley; Second Vice-President, A. A. Etienne; Third Vice-President, John H. Gould; Fourth Vice-President, T. A. Burnett; Fifth Vice-President, J. J. Cranwell. M. Jacob was unanimously reëlected Treasurer.

Colorado Springs, Colo., was selected as the place for the next annual meeting, after a careful consideration of the invitations received from various other cities.

President Cary in his address urged that steps be taken to provide the Association with a permanent home. This idea appealed to the members of the Association, and it was decided by vote that the Executive Board should proceed to make inquiries relative to location and cost of suitable buildings for the purpose and be prepared to report at the next annual meeting.

The alumni meetings were held on Tuesday evening. A special performance of an elaborate pageant was given at the Coliseum Wednesday for the entertainment of the members and their friends. This was a most agreeable surprise and was well worth the trip to Columbus. The banquet Thursday evening was most enjoyable.

Instead of following the usual course in such affairs, professional entertainers were provided.

On the whole, the meeting at Columbus was a great success in every respect. The weather was ideal, the program was instructive, and the entertainment provided was decidedly more than we anticipated. We shall always remember with pleasure the Columbus Convention.

RELATION OF VETERINARIAN AND FARMER TO DISEASES OF LIVE STOCK

THE numerous deaths from anthelmintics improperly administered naturally lead to the conclusion that the administration of such drugs as anthelmintics is properly the field of the veterinarian and not of the farmer and stockman. In actual practice, the farmer and stockman desire treatments that they can administer themselves, including those for removing worms, and some men habitually do their own veterinary work along certain lines. In the endeavor to preserve the balance of income and expenses, it is only natural that more or less of this should be done. However, the not infrequent losses which result from this practice warrant a consideration of its advisability in a given case. So far as anthelmintics are concerned, we are dealing with potent drugs, and it is necessary, in order to avoid losses, that one know the nature of the drugs, the dosage, the anatomy of the animals to be treated, and the conditions which make it dangerous or inadvisable to administer anthelmintic treatment in any given cases. Ignorance along these lines—and farmers and stockmen are not usually informed along these lines—may mean serious loss, and regrets are of little avail when a herd has been killed by ignorance of such anatomical details as the median pharyngeal recess in swine, or of exact dosage, or of the conditions which may cause an otherwise beneficial anthelmintic to kill the animal treated.

The prevention of worm infestations in stock is more important and more profitable to stockmen than is treatment for existing infestations. Parasitism causes animals to be unthrifty. They are set back in their growth and development. Anthelmintics may free animals from their parasites and permit them to regain their health, but if they have carried their parasites through the growing period of youth, the golden opportunity for full development and growth is lost, and the anthelmintic treatment itself is, to a certain extent, a shock from which the animals must recover. Moreover, the fact that we have no satisfactory treatment at present for such worms as

nodular worm and whipworm is another reason for emphasizing preventive measures.

Prevention of parasites is largely a problem in cleanliness and especially in manure disposal. It is safe to assume that manure always contains worm eggs and is always dangerous. It is least dangerous when fresh, before the worm eggs have a chance to develop to the infective stage or reach the necessary intermediate host that will convey them back to live stock. Therefore, the prompt removal of manure and its disposal in places where it is least apt to get its worm content back to stock is a measure of great value. Spreading it where it will dry quickly or plowing it under are good methods of disposal. Since swine have almost no parasites of importance in common with cattle and sheep, it is safe to put swine manure on pasture where cattle and sheep are pastured, and vice versa, and horses may be alternated with swine or with cattle and sheep. Pasture rotation removes animals from the manure on pasture and thus aids in avoiding infection. Persistent use of the same pasture concentrates the infection; in other words, *permanent pastures perpetuate parasites.*

M. C. H.

THE TRACTOR AND THE HORSE

THE impression that the use of the tractor will eliminate a large percentage of the horses kept on the farm has not been borne out by a study of the subject by the Office of Farm Management of the United States Department of Agriculture, the results of which have recently been published as Farmers' Bulletin 1093. The inquiry covered a full year's work on 191 farms in seven States in the Corn Belt. It was found that while the use of the tractor brought about a reduction of about one-fourth in the number of horses kept on the farms, the remaining horses continued to perform three-fourths of the tractive work. In other words, the tractor may cause a slight reduction in the number of horses needed for farm work, but the horse still remains indispensable for most of the work. The chief value of the tractor lies in its ability to do heavy work, especially plowing in hard soil, and to cover the desired acreage in a shorter time than the same work can be done by horses. The best results seem to come from the combined use of both horse and tractor, each doing the work that it can do to best advantage and each supplementing the other.

The purchaser of a tractor is advised to keep enough horses to cultivate corn and do other necessary work which must be done at the same time, but which the tractor cannot do.

PRESIDENTIAL ADDRESS¹

By C. A. CARY, Auburn, Ala.

NOVELTY and newness (new things, unexpected and unknown things) attract attention, excite interest and are quickly carried to the world public. The public wants exciting, thrilling news, and the daily papers supply the demand. The medical man is not unlike the average man. He has a keen outlook for new things, discoveries, and too many times he is not sufficiently conversant with the well-established facts that would make him more efficient in his profession. It is not my purpose to say that our Association shall be so conservative that it can not grow, or shall be so progressive and radical that it may grow rapidly and then rapidly decay. Unhealthy growth spells decay. Too much conservatism prevents growth.

LIMITATIONS OF THE PRESIDENCY

Some of our members seem to think that the President of the A. V. M. A. has unlimited powers. His official time is short, and his preparation, experience, and knowledge of the workings of the Association are very limited. Sometimes he can not get definite and positive facts about questioned subjects before his term of office expires. His powers are largely suggestive and appointive rather than constructive. And I suspect that the limited executive powers of the President are for the good of the Association. As a rule hasty changes, revolutionary or radical in effect, should not be made. Hence the value of suggestive, constructive changes, which give time for the members of the Association to measure and consider before adopting them. In suggesting I do not wish to assume the place of a prophet, or to be too arbitrary, or overreach the conditions and facts. I have at heart the good of the profession and the welfare and advancement of this great Association.

Observe and consider here that it would be a great help to the President and all officials of the Association if a copy of the business proceedings of each meeting were printed and placed in the hands of each officer and member very soon after the meeting. I have been unable to act promptly and have made some errors because I did not have such a copy.

We have five Vice-Presidents, and they have no definite work to

¹ Delivered at the Fifty-seventh Annual Meeting of the American Veterinary Medical Association, Columbus, Ohio, August 23, 1920.

do. It seems to be unjust to them to give them honor without work. I do not think they love mere ornamentation. Why not make these officers mean something? If possible make them into a committee, or require them to give five- or ten-minute written annual reports



DR. C. A. CARY

on their respective districts, and elect these men to represent their respective districts.

REPRESENTATION IN OTHER BODIES

Our relation to the decennial convention that revises the United States Pharmacopœia is one that should be considered and some

action taken at this meeting. As suggested by Dr. Mohler, a Special Committee on Pharmacopœia should at once be created. This committee should at once prepare a list of drugs to be recommended to the Committee on Revision for induction into the Pharmacopœia. Arrangement also should be made by this special committee for the admission of the American Veterinary Medical Association to membership in the decennial convention on the revision of the United States Pharmacopœia.

No funds were available for a membership or a delegate to the National Research Council of the National Academy of Science. The affiliation can be secured if funds are made available to pay the expenses of a representative of this Association to that convention.

THE NEW ARMY VETERINARY LAW

A few words about the new Army veterinarian may not be out of place. There are defects and good things in the new veterinary law. According to Officer John H. Gould, the most valuable feature of the new law on the Veterinary Corps is the acquisition of rank up to and including colonel. There may be many other good things come out of this new law that time and its application will bring out. While we have a very efficient and capable chief in Colonel Morse, who is now acting head of the Veterinary Corps, we can not and should not forget that our interest would be handled to our greater satisfaction, and, I trust, with equal and possibly better efficiency, with a veterinarian at the head of the Corps. It may take time to make the new Veterinary Corps function at its best under the new law, and by the time the new machinery gets to running we can secure another or many other advances that make for better efficiency, and then the standard may be raised. It is not my purpose to enumerate and discuss the defects in the new law. They will come out as it is put into action. And the Army veterinarians should keep our Committee on Legislation informed so that we can secure legislative improvements. I do not think it would at all be wise for personal bickerings or fights about petty or big promotions to become the foundation of our work for better and improved legislation. Such things have held us back and down in times past. Sink personal prejudices and selfishness and see the good that may come to the future Army veterinarian and the profession in a higher standard, a more equitable or favorable (as to time and service) system for promotions, more officers (active and reserve) and all

other things commensurate with the requirements of a modern and growing army.

THE EDUCATIONAL PROBLEM

Lest I be found wanting, let me touch the great question of veterinary education. Someone has said that human medicine is made up of "facts, statistics, theories, speculations, probabilities and even possibilities," and that the student at best can take only a very small, carefully prepared, digestible, or even a predigested, portion of this great mass of knowledge and theory. Would it not be wise and simplify our teaching if the best qualified men in our profession were to sift and select the facts and the best theories in veterinary medicine and then advise our teachers and institutions to teach and demonstrate to the student that which we know, and not waste so much time on hypotheses, speculations, probabilities and even possibilities that never were half baked but become factors of confusion in the minds of the student? What a field for work! Why should book writers compile works on medicine when so little of the contents are known from the experience of the writer and he possesses no means of verifying them?

The United States Civil Service Commission has recently ruled that the entrance requirements of all accredited veterinary colleges shall be not less than fourteen high-school units and the course shall cover four years in length. Hereafter all recognized colleges must equal that standard or their graduates can not stand civil-service examinations for Federal appointments. There does not appear any reason for decreasing or going backward in entrance requirements. If anyone should be so unwise as to advocate easier requirements, let him recall where the veterinary graduate stood when the tests were made of professional men in the United States Army.

A selected committee of highly qualified, disinterested men can visit every veterinary college on this western hemisphere and find a few good and efficient teachers in each and every school. However, there are inefficient teachers and instructors. Some teachers may know facts but can not lead or get the student to grasp them, or develop mental ability, activity or skill or art. Some teachers waste time in trying to make students learn and believe possibilities. For example, some teachers stuff the student with too many unimportant, useless facts. Too much of a student's time is wasted in trying to make him memorize unimportant details in anatomy. I hope to see the time when anatomy will be taught only in the dissecting room and be confined, for the undergraduate, to gross anatomy, and

let the detail anatomy be given to students and post-graduates who study special anatomy for specialty practice. Quit wasting the time and mental energy of the student on the long-drawn-out anatomy of the solipeds, and give more general dissecting-room anatomy of the ox, sheep, hog, dog, cat and poultry.

Again, there are too many teachers who are in colleges because of lack of money on the part of the college to get better teachers. In some instances very good teachers for some subjects are not available. Can this be changed? Not now. When the colleges get more money and the teachers stop wasting the time of the students on the excess of nonessentials and confine their instructing and laboratory demonstrations to the fundamental and plain facts, will there be developed teachers, students and veterinarians who may grow into any specialty by study, practice and post-graduate work.

Let the laboratory teachers stop trying to empty all the questionable things into a student's head and expect him to analyze and retain and use them. Take modern bacteriology. The student is required to remember a multitude of details about a great number of germs, some of which are so uncertain and vague that the expert bacteriologists fight and disagree about their cultural and biological characters. Why not confine the teaching of such a subject to the best-known pathogenic bacteria, and leave all the rest for the man who can and will get it if he becomes a specialist? To be brief, too many teachers (didactic and laboratory teachers) believe that the whole knowledge of medicine is confined to his special subject, and then proceed to cram it all into the student, without ever stopping to consider that the general medical student must acquire some knowledge of other subjects.

Want of properly conducted clinics is a defect in some veterinary colleges. Too many of the teachers have had no field experience, and they develop a peculiar, narrow method of college or highly scientific clinics and are so exact that the student never meets the same conditions in actual practice of any kind when he leaves the college walls.

If there be one phase or feature of domestic animal life that the veterinarian should know in its fullness it is animal husbandry. How few veterinary schools give a reasonably full course in animal husbandry! The veterinarian must know how to judge feed and breed and to handle all kinds of farm animals. To do this he must have practice in handling and judging and feeding. He must know

much about the dairy industry, sheep husbandry, swine and poultry breeding, and feeding and marketing.

In order to maintain and advance the standard of veterinary medical education in America the college must have:

(1) High entrance requirements, based not only on general educational credits, but also on credits founded on practical experience, educational and other allied work.

(2) Better teachers must be obtained, more all-time teachers who know by instruction and experience and can do real teaching.

(3) The laboratory work in the college must be more definite and confined to what are the facts and not waste so much time on theory and speculation.

(4) The college should be located where ample space for buildings, yards and fields may be obtained and where sufficient cattle, horses, mules, sheep, swine, poultry, dogs and cats for clinical dissection and other laboratory uses may be obtained.

(5) Buildings should be constructed and arranged upon the unit system, so that the chief departments will have separate buildings, yards, etc. Each building (with very few exceptions) should have only one story. One or two sky-scrapers with all departments crowded into them should be avoided.

(6) The undergraduate course of study should be arranged for average men who have necessary entrance requirements, and not for post-graduates or specialists.

(7) Post-graduate courses may be given to produce specialists in surgery, physiology, pathology, bacteriology, hygiene, parasitology, special animal practice, research work, specialists in municipal, State and Federal sanitary science and police, in meat and milk inspection, in animal husbandry, in dairy practice and in teaching.

(8) In no case should the undergraduate instruction or course attempt to make specialists of all kinds, as has been done in the past. The chief aim should be to give general fundamental medicine to produce or develop practitioners and men who are ready to take up a specialty.

(9) Better field and hospital work should be supplied in all colleges, and, if possible, vacation periods should be spent in hospitals or in practice.

(10) It is possible that the entire year should be occupied in some line of educational work. What is now given over (three or four months) to rest and vacation could be spent in practice, in

hospitals or in actual college work at some college where summer work is given.

(11) Less time should be wasted on football, other games, holidays and numerous idle periods. If exercise and development are required, let them be in the form of constructive work in gymnasiums, military drill, etc.

REACHING THE PRACTITIONERS

This Association has a membership of nearly 5,000 veterinarians. The members are largely in the United States and Canada. The greater number are practitioners, yet I judge that not more than 25 per cent of the practitioners are members of our Association. Why this condition? It appears to be due to many factors and conditions. What concerns us is, Wherein is the Association wanting? Is the Association reaching the man in practice? In a great measure it is developing and benefiting many men in practice. But is there not some way by which this Association could get into closer touch with men in practice? The Association must realize that less than 50 per cent of its members can attend its annual meetings; and, up to date, rarely do 25 per cent of its members attend annual meetings. No organization can hold and influence and benefit or build up its membership of practitioners without giving these field men something to do, some power or influence in the organization. This is not a new idea; it is as old as civilization. Governments are harking back toward pure and simple democracy in which every individual may have some power in government. Our Republic is now about to take on universal suffrage. Kings and emperors are giving way to the rule of the people.

Our Constitution and By-Laws should be amended in some way so that every member in good standing may vote on all important subjects and in the election of all important officers. This matter was considered by the Committee on Revision of the Constitution and By-Laws, and the present adopted Constitution and By-Laws provide that home members may vote to elect members of the Executive Board and on certain referendum subjects. But this does not reach the point of attraction or interest. The Secretary's records will show that too many members are sliding back and out for lack of interest and for non-payment of dues. Obviously there are factors that account for this backsliding or cutting loose from the Association. Would it not be well to have a special committee appointed to make a survey and see if some remedy or changes in

our Constitution and By-Laws can be made to meet the wants of the home veterinarians who need our help?

SECRETARY, EDITOR AND HEADQUARTERS

The Secretary is the main working man of this Association. He does more, controls more actions and functions than the President, and justly and rightly so. He comes close to being the heart of the Association. In order to know he must have experience and common sense, executive, clerical and emergency ability. That he may best work and best function, he should have a long term of office and be selected for his good natural sense, executive ability and honesty. To have a good Association it is self-evident that an efficient Secretary must be had. We are not doing what we could because our present arrangements do not call for an all-time Secretary. Now in order to do that it may be necessary to do the next best thing. As Dr. Mayo suggested at Philadelphia, combine the editorship of the official JOURNAL with the secretaryship, and give him sufficient help and let him do both. The duties of Secretary and Editor are closely associated, and the same type of man is essential for both lines of work. If funds permit, it would be still better to have an all-time Secretary and an all-time Editor, and, when possible, departmental editors.

That is not all that may be done to make the Secretary and Editor more helpful and efficient. In addition to an all-time Secretary and Editor, we need an all-time home for this double head and heart of the organization. This home need not be in a big city or at a college. It should be in a small town or city centrally (geographically) located. Why there? Because it would cost less to buy a suitable, commodious, healthy place, house or houses and grounds, and would be away from untoward local influences. In it there should be educational rooms, filing and other rooms for the Secretary and his clerks, and, if necessary, space and rooms for a printing plant. We are ready for the all-time Editor and Secretary and the all-time home. Let us get together and get them, lest we forget our duty and waste more time with an inefficient system that permits us to drift. Look at the good work of the American Medical Association.

Our frequent and sudden changes of Secretary and Editor have given us no stability or definiteness of purpose, and such changes have been financially expensive. For the good of the Association we are sadly in need of a fixed, permanent home. Let us make one and keep it and develop it.

THE PRODUCTION AND EXPERIMENTAL USE OF BOTULINUS ANTITOXIN, TYPES "A" AND "B"

By G. H. HART, and F. M. HAYES,

University of California, Berkeley, Calif.

IN the winter of 1918 and 1919, forage poisoning of horses was unusually prevalent in California. One outbreak occurred on a purebred stud farm, and in a period of about three weeks 13 valuable horses died, entailing a financial loss of several thousand dollars. A very heavy rain, varying from 3 to 6 inches in different parts of the State, had occurred in September. This was followed by warm weather and the winter continued mild throughout. A great deal of hay was wet in the field by the rain, some being in stacks, but also much that had been baled and piled without being under cover. This became moldy and more or less spoiled. It is true that in all of the outbreaks visibly spoiled feed was not demonstrable, but nevertheless the above described weather and feed conditions are those in which we expect forage poisoning to become prevalent.

The work of Buckley and Shippen (1) and Graham, Brueckner and Pontius (2) had shown the close similarity of this disease to that produced by toxin of *Bacillus botulinus*, first isolated by Van Ermengem (3, 4) from ham, the consumption of which had caused human deaths in Ellezelles, Belgium. Botulinus antitoxin had been produced by Graham, after the method used by European investigators, and when injected into horses was found to have marked protective value against a subsequent injection of botulinus toxin. A limited supply of this antitoxin was obtained from the University of Illinois and tried as a therapeutic agent in several cases of the disease in horses by ourselves and also by Dr. L. M. Hurt in the southern part of the State, without beneficial results.

Dickson and Burke (5, 6, 7, 8, 9, 10), of Stanford University, had done some very extensive and elucidating work on botulism in the human family and the bacteriology of *B. botulinus*. In their study of cultures of the organism from various sources they found, as had previously been done by J. Leuchs (11), that at least two types of the organism were present, which could only be differentiated by toxin-antitoxin tests. These they classed as "A" and "B," respectively, while Leuchs, in his work in 1912, had differentiated the strains with which he was working under the letters "E" and "D."

These letters were probably used by Leuchs because his "E" culture was the Ellezelles organism isolated from ham by Van Ermengem and his "D" culture was the Darmstadt organism isolated by Von Gaffky from bean salad.

Kemper (12) was the first man to produce botulinus antoxin. On small animals he was not so successful, but later he succeeded in immunizing two goats out of three so that their serum had antitoxic properties. Leuchs first produced the antitoxin in quantity, using horses and immunizing them separately against the two strains of the organism. He showed by experimentation on small animals that antitoxin produced from his "E" strain of *B. botulinus* had practically no protective qualities against toxin produced from his "D" strain of the organism, and vice versa. Dickson and Burke confirmed this work with their "A" and "B" strains.

In testing the Graham antitoxin against these two strains of the organism, Burke found that it had been produced with the "B" strain and therefore would have protective value only against toxin produced from this type of the organism. From the work of Dickson and Burke on strains of *B. botulinus* from various parts of California, it was evident that the "A" type of the organism was much more prevalent in this State.

In an outbreak of forage poisoning in horses at Oakdale, Calif., where the Graham antitoxin had been used with no beneficial results, Burke isolated *B. botulinus*, "A" type, from the hay which the affected horses had been eating and which was considered to be the feed causing the disease.

It therefore became evident that, if any experimental trials of the therapeutic and preventive value of botulinus antitoxin in forage poisoning in horses were to be made, the development of a supply of antitoxin of both strains was essential. Therefore, in April, 1919, two horses were started to be immunized against the toxin and were designated type "A" horse and type "B" horse, respectively.

PREPARATION OF ANTITOXIN

In carrying on this work the dosage used in the immunization work previously carried on by the United States Bureau of Animal Industry and obtained from J. S. Buckley, Chief of the Pathological Division, was followed.

In this article the letters m.l.d. are used to indicate the minimum lethal dose of toxin that will kill a guinea pig weighing between 250 and 300 grams, in 48 hours, when injected subcutaneously.

The organisms were grown in deep tubes or special culture bottles in 2 per cent glucose beef broth, made 2 per cent alkaline before sterilization (hydrogen concentration after sterilization, 8.4), and incubated at 26 degrees F. for 21 days, the time and temperature which the work of Dickson and Burke had shown to develop the toxin best. At the end of the incubation period the broth was filtered through Berkfeld filters.

The type "A" culture used in this work was one that produced about 450 m.l.d. per mil. The type "B" culture was very much weaker in toxin-producing ability and averaged about 40 m.l.d. per mil.

As the same culture of either strain of the organism does not always produce the same strength toxin under favorable conditions, it is, of course, necessary to test each new batch on guinea pigs in order to ascertain the potency. The toxin undergoes oxidation when exposed to the air and becomes weaker. When kept in well-filled and sealed bottles or under an oil float in the ice box, its reduction in toxicity is very gradual and it can be kept for several months at least. It must, however, be tested on guinea pigs from time to time to ascertain its degree of lowered toxicity.

The first two antitoxin horses, type "A" and type "B," respectively, were injected subcutaneously, beginning April 21, 1919, and continuing as shown in the accompanying table.

During the hypering period, several tests were made to determine whether the serum in 1 c.c. quantity would protect a guinea pig against the last amount of toxin injected into the horses. The first one was made July 3, 1919, from blood drawn June 30, 1919, the horses having 10 days previously, on June 20, received a subcutaneous injection of 25 3-5 m.l.d. Two guinea pigs were used with each type, one receiving 1 c.c. of serum and 25 m.l.d. of toxin and the other 1 c.c. of serum and 10 m.l.d. of toxin. The toxin and serum were mixed *in vitro* and injected immediately.

In the case of the "A" horse serum, both pigs were apparently normal at the end of 24 hours, but rapidly went down after that time, and both were dead at the end of 48 hours.

The pigs used to test the "B" horse serum remained normal and after several weeks were discarded. Up to this point, therefore, the "B" horse was producing a more potent serum than the "A" horse.

The second test was made September 16, 1919, with serum drawn September 14, 8 days after 200 m.l.d. of toxin had been administered. In this case only one guinea pig was used with each type.

Table showing doses and time between injections in hyper-immunizing horses to botulinus toxin

TYPE "A" HORSE					TYPE "B" HORSE		
Injection		Received m. l. d.	Toxin	Series	Received m. l. d.	Toxin	Series
No.	Date						
1919							
1	April 21	1/20	A	1	1/20	B	1
2	" 26	1/10	A	1	1/10	B	1
3	May 2	1/5	A	1	1/5	B	1
4	" 6	2/5	A	1	2/5	B	1
5	" 14	4/5	A	1	4/5	B	1
6	" 21	1-3/5	A	1	1-3/5	B	1
7	" 29	3-1/5	A	1	3-1/5	B	1
8	June 6	6-2/5	A	1	6-2/5	B	1
9	" 12	12-4/5	A	1	12-4/5	B	1
10	" 20	25-3/5	A	1	25-3/5	B	1
11	" 30	50	A	1	50	B	1
12	July 5	100	A	1	100	B	1
13	" 18	200	A	1	200	B	3
14	Aug. 1	450	A	1	450	B	3
15	" 12	1,000	A	1	1,000	B	3
16	" 26	100	A	1	100	B	3
17	Sept. 6	200	A	1	200	B	3
18	" 18	400	A	3	400	B	3
19	" 25	800	A	3	800	B	3
20	Oct. 3	1,600	A	3	1,600	B	3
21	" 15	3,200	A	3	3,200	B	4
Both horses bled first time October 25, 1919.							
22	Nov. 10	1,600	A	3	1,600	B	4
23	" 18	3,200	A	4	3,200	B	5
24	" 30	4,800	A	4	4,800	B	6
Both horses bled second time December 12, 1919. Both horses bled third time December 15, 1919.							
25	Dec. 30	2,400	A	5	2,400	B	6
26	1920 Jan. 7	4,800	A	5	4,800	B	6
"A" horse died 8 days after this injection.							
27	Jan. 19				5,900	B	7

"B" horse bled fourth time January 31, 1920.

"B" horse bled fifth time February 4, 1920.

One cubic centimeter of serum from each horse was mixed in vitro with 133 m.l.d. of the respective toxin and injected immediately. The "A" type pig remained normal for several days, but gradually became paralyzed and died the night of September 24, 8 days after inoculation. The "B" type pig remained normal until discarded after 6 weeks.

On October 15, 1919, the horses were given a subcutaneous injection of 3,200 m.l.d. of the respective types "A" and "B," and 10 days following this injection were bled, as we were anxious to get some antitoxin for experimental purposes. The serum from this bleeding was collected, filtered through Berkfeld filters and bottled after carbolizing a portion of it.

One cubic centimeter of the "A" type serum was found on testing to be sufficiently potent to protect a guinea pig completely against 500 m.l.d. of "A" type toxin, and the same amount of "B" type serum to protect a guinea pig against 1,000 m.l.d. of "B" type toxin. It was felt that while a much higher potency serum was desired, this was sufficient to carry out some experimental work while larger doses of toxin were being administered to the horses.

One cross test of the "A" and "B" types of antitoxin was made on November 28, 1919. Two hundred m.l.d. of type "A" toxin, mixed in vitro with 1 c.c. of type "B" serum and injected, killed the guinea pig in 12 hours, although this serum completely protected a guinea pig against at least 1,000 m.l.d. of type "B" toxin mixed and injected in the same manner.

On November 30, 1919, both horses received 4,800 m.l.d. of the respective toxins, and both were bled the second time on December 12, 1919, followed by a third bleeding on December 15, 1919. Serum from these bleedings of the "A" type horse was much more potent, and 1 c.c. of it added to 3,500 m.l.d. of toxin in vitro and injected immediately rendered it harmless to guinea pigs.

The second injection following this third bleeding caused the "A" horse to break with symptoms identical to those of forage poisoning on the eighth day following the injection. In spite of the intravenous administration of 100 c.c. of its own antitoxin on the eighth day and 225 c.c. additional on the ninth day, it continued to get steadily worse and was dead on the morning of January 19, 1920, 12 days after the injection. The toxin used in the last two injections on this horse was a new batch, series 5, of the same culture. With previous batches $\frac{1}{4}$ to $\frac{1}{8}$ c.c. of a dilution consisting of 1 part of toxin to 36.5 parts of distilled water had constituted 1

m.l.d. In testing this batch on December 24, 1919, the guinea pig receiving $\frac{1}{4}$ c.c. was dead in 20 hours, and the one receiving $\frac{1}{8}$ c.c. was dead in 30 hours. Without testing on more guinea pigs, 1-12 c.c. was estimated to be 1 m.l.d. After the horse died, another test was made of the toxin, and 1-16 c.c. of the same dilution, 1 to 36.5, proved to be 1 m.l.d. The toxin, therefore, contained 584 instead of 438 m.l.d. per cubic centimeter. Consequently on the twenty-fifth injection the horse received 3,212 instead of 2,400 m.l.d., and on the twenty-sixth injection 6,424 instead of 4,800 m.l.d., which was the cause of its death.

The "B" horse was given a final dose of 5,900 m.l.d. of toxin on January 19 and bled the fourth time on January 31 and the fifth time on February 4, 1920.

We now had on hand a number of liters of a fairly potent antitoxin of both types, "A" and "B," and with this material the following experimental work was carried on.

EXPERIMENTAL WORK

The object of the experimental work was primarily to ascertain whether botulinus antitoxin had any therapeutic value against the symptom complex produced by the administration of botulinus toxin or in natural outbreaks of forage poisoning. The work of Graham on horses and Dickson on experimental laboratory animals, together with that of Van Ermengem, Kempner and Leuchs, had definitely shown its prophylactic value, but if completely lacking in therapeutic effect its field of usefulness would be greatly curtailed.

Experiments on Chickens

In order to ascertain the fatal dose for a chicken, hen No. 1 was given 103 m.l.d. of type "A" toxin subcutaneously. Two days later she showed typical symptoms of limberneck and died on the third day, about 70 hours after the injection.

Chicken No. 2, a cockerel, and No. 3, a pullet, were given 50 m.l.d and 200 m.l.d., respectively, of type "A" toxin, by the mouth in feed, without producing any symptoms of limberneck.

This indicated that a chicken is somewhat more resistant to the toxin than a guinea pig in proportion to body weight when injected subcutaneously, and also that a considerably larger dose of toxin is necessary to kill a chicken by the mouth than when injected under the skin.

On December 22, 1919, at 9 a.m., cockerels Nos. 4, 5, 6, 7 and 8

were each given 80 m.l.d. of type "B" toxin subcutaneously. At 1 p.m. No. 4 was given 3 c.c. of type "B" serum subcutaneously. At 5 p.m. No. 5 was given 3 c.c. of type "B" serum subcutaneously. At 9 a.m., December 23, No. 6 was given 3 c.c. of type "B" serum subcutaneously. At 9 a.m., December 24, No. 7 was given 3 c.c. of type "B" serum subcutaneously. No. 8 was left untreated.

On December 26 the untreated chicken showed a drooping of the head and cyanosis of the comb. Through December 27 and 28 it continued to show typical symptoms of limberneck. In the following days it gradually improved and finally made a complete recovery. As late as January, 1920, however, although apparently normal on observation, it showed early fatigue on excitement and exercise. The four chickens receiving the serum following the toxin at intervals of 4 to 48 hours failed to show anything abnormal.

This experiment tended to show the protective value of the serum in chickens when given following the administration of toxin but before the appearance of symptoms.

On January 19, cockerel No. 4, from the foregoing experiment, was given 120 m.l.d. of type "B" toxin subcutaneously, and remained normal. On January 26, No. 5 was given 240 m.l.d. and remained normal. No. 6 became affected with an intercurrent disease being studied by other members of the staff, and was discarded. On January 29, No. 7 was given 500 m.l.d. of type "B" toxin. This cockerel showed some evidence of limberneck from February 3 to 9, but made a complete recovery.

These experiments tended to show that the previous administration of toxin and antitoxin had conferred some immunity, but as the action of type "B" on fowls is somewhat variable, too much dependence can not be placed upon it.

On January 31 five additional fowls, Nos. 9, 10, 11, 12 and 13, were each given 400 m.l.d. of botulinus toxin, type "B," subcutaneously, at 9 a. m. At 1 p. m. No. 9 was given 5 c.c. of type "B" serum, subcutaneously. At 5 p. m. No. 10 was given 5 c.c. of type "B" serum, subcutaneously. At 9 a. m., February 1, No. 11 was given 5 c.c. of type "B" serum, subcutaneously. At 9 a. m., February 2, No. 12 was given 5 c.c. of type "B" serum, subcutaneously. No. 13 was left untreated.

On February 5 Nos. 12 and 13 were affected and showed weakness, sitting on the floor of the cage instead of on the perch. Their heads, however, were not drooping. No. 12 recovered after a few days, but No. 13 remained affected and developed a drooping of

the head. It suddenly broke with the intercurrent disease mentioned above and died on February 15.

This experiment tended to show the variability of the action of "B" type toxin on chickens, as the much larger dose of toxin should have killed the untreated chicken before 15 days had elapsed. It also indicated that the larger the dose of toxin the earlier antitoxin must be given to produce complete protection, as evidenced by fowl No. 12, which did not receive antitoxin for 48 hours, becoming affected.

Another culture of type "B" of high toxin-producing ability was later obtained, to which chickens were very refractory. Broth cultures of this organism, incubated 21 days and filtered, showed 1,500 m.l.d. of toxin per cubic centimeter in the filtrate. Cockerel No. 20 was given 1,500 m.l.d. of this toxin by the mouth; cockerel No. 21 was given 4,500 m.l.d. of this toxin by the mouth; cockerel No. 22 was given 1,500 m.l.d. of this toxin subcutaneously; cockerel No. 23 was given 15,000 m.l.d. of this toxin subcutaneously. All of these cockerels remained normal except No. 23, which developed a typical case of limberneck and died in about 60 hours after the injection.

On February 19, at 4:45 p. m., cockerels Nos. 4, 5 and 8, previously mentioned in type "B" toxin experiments, were each given subcutaneously 400 m.l.d. of type "A" toxin. The following morning all three fowls were badly affected with limberneck, being hardly able to stand and heads drooping to the ground. At 11 a. m. No. 8 was given 15 c.c. of type "A" antitoxin subcutaneously, and No. 5 was given the same dose intravenously, while No. 4 was left untreated. During the day all three became weaker, Nos. 4 and 5 being worse than No. 8. The following day Nos. 4 and 5 were dead and No. 8 was unable to stand. At 3 p. m. it received 15 c.c. more of "A" type antitoxin subcutaneously. The fowl lived through the day but was dead on the morning of February 23. From the beginning the disease had gradually progressed to a fatal termination in this fowl, and it is doubted whether the serum really prolonged its life. The experiment indicated that chickens are definitely more susceptible to type "A" than to type "B" toxin.

On March 15 cockerels Nos. 7 and 11, previously used with "B" toxin experiments, were each given, per mouth, 3.5 c.c. type "A" toxin, series 5, the same which had proved fatal to chickens 4, 5 and 8 in 1 c.c. doses (400 m.l.d.) subcutaneously. These cockerels remained unaffected.

On March 17 cockerels 14, 15, 16, 17 and 18 were placed in an

experiment to ascertain the dose of "A" toxin by the mouth that would be fatal. No. 14 was given 2 c.c.; No. 15, 4 c.c.; No. 16, 6 c.c.; No. 17, 8 c.c.; and No. 18, 10 c.c., of type "A" toxin, containing 584 m.l.d. per cubic centimeter. The material was placed in the esophagus of the fowls with a glass pipette.

No. 18 was badly affected on March 18 and was dead on the morning of the 19th. Nos. 16 and 17 both showed typical symptoms on the 19th, but lived for several days, No. 17 being found dead on the morning of March 22 at 8:30 a. m., and No. 16 on March 23. No. 15 was slightly affected on March 19, and the disease steadily progressed, the chicken being found dead on the morning of March 22. No. 14 showed symptoms on the 19th, and during the 20th, 21st, 22d and 23d they progressed until the chicken, to all appearance, was moribund. Improvement was noticed, however, on the 24th, and continued rapidly so that the chicken was able to stand on the 25th and gradually made a complete recovery.

On March 31, 1920, cockerel No. 19 received 3 c.c. and cockerel No. 20 4 c.c. of the same toxin in the same manner as the above-mentioned five chickens, and the only symptoms shown were slight droopiness and sitting down on the floor of the cage for several days, followed by complete recovery.

These experiments indicate the fatal dose when given by the mouth to be somewhat variable.

Experiments on Horses

Horse No. 1 was used in an effort to establish some idea of the fatal dose of toxin for this animal as compared to a guinea pig.

The animal was injected subcutaneously on January 8, 1920, with $\frac{1}{2}$ c.c. of type "A" toxin, series 5, amounting to 292 m.l.d. It remained normal until the third day, when it was slightly droopy. The symptoms progressed gradually until the fifth day, when the animal showed drooping of the head, marked weakness of legs, incoördination of movements and staggering gait. Attempts to eat grass from the pasture were successful in prehension but resulted in the bolus dropping from the mouth after efforts to swallow it had failed. On the sixth day the animal was down and made trotting motions with the fore and hind legs. There was marked jugular pulse, mouth held partly open and tongue lolling out. Pulse, 90, and very weak; respiration, 18; temperature, 99° F. The animal died on the night of January 14, after having shown typical symptoms of forage poisoning.

The small dose proving fatal showed that horses are more susceptible to the toxin injected subcutaneously than guinea pigs in proportion to body weight.

On February 18, experimental horse No. 4 was injected with the same dose of type "A" toxin as had proved fatal to horse No. 1, with the intention of giving antitoxin after symptoms developed. On the fifth day the horse showed weakness in the hind quarters, but no mouth symptoms, and was eating well. It was, therefore, decided to postpone treatment until the following day. During the night, however, the animal had apparently lain down in the pasture close to a deep ravine and in struggling to rise had fallen down the bank. On the morning of the sixth day it was found in the creek, having fallen a distance of 15 feet. The animal was in such a position that it could not be extricated without great difficulty. There was also danger of internal injury from the fall and it was considered not a satisfactory case to attempt to give the antitoxin treatment. The condition of the animal rapidly became worse and it was destroyed the following day.

On February 22 horse No. 5 was fed 3 c.c. of type "A" toxin, 1,200 m.l.d., in one quart of barley, and horse No. 6 was fed 6 c.c., 2,400 m.l.d., in the same manner. This was 4 and 8 times respectively the amounts that had proved fatal on subcutaneous inoculation, and was given to ascertain the dose by the mouth that would prove fatal. Somewhat to our surprise, both horses remained normal. On March 18, horse No. 6 was fed, in barley, 45 c.c. of type "A" toxin, testing 584 m.l.d. per cubic centimeter, or a total of 26,280 m.l.d. This large amount did not produce any abnormal symptoms. Thinking the animal had a strong relative immunity to the toxin and consequently could furnish quickly a potent antitoxic serum, it was given 3 c.c. of "A" toxin, 1,754 m.l.d., subcutaneously, on April 1. At the same time horse No. 5 was given 45 c.c. of "A" toxin, 26,280 m.l.d., by the mouth in barley.

On April 3, at 6 p.m. both horses were found to be markedly affected with the disease. They were sweating profusely and walked with a weak, staggering gait. At this time horse No. 6, which was more severely affected, was given 225 c.c. of type "A" antitoxin intravenously.

The following morning, both horses were down and unable to rise, showing typical symptoms of forage poisoning. Horse No. 5 had a pulse of 57; temperature, 100.2° F.; respiration, 18. Horse No. 6 had a pulse of 80; temperature, 100.6° F.; respiration, 20.

Each of the animals was given 225 c.c. of type "A" botulinus antitoxin, but no improvement was noticed from its use. Horse No. 5 died during the night and horse No. 6 the following night. These animals were, therefore, not favorably affected by antitoxin, despite the fact that No. 6 had received a total of 550 c.c., half of which was given in the early stages before the animal was decumbent.

The antitoxin used in these cases was the third bleeding from the "A" horse. It was tested again on April 7, 1920, and 1 c.c. protected a guinea pig against 3,500 m.l.d. of toxin when mixed and injected immediately. On April 13 a test was made in which the mixed antitoxin and toxin were allowed to stand at room temperature for one hour as in the standard method of testing tetanus antitoxin. In this case the serum gave complete protection to a guinea pig in the proportion of 1 c.c. to 11,680 m.l.d. This showed that the antitoxin was fairly potent.

Experiments on Cattle

On January 8 a thin yearling heifer, No. 186, was injected subcutaneously with 2,000 m.l.d. of type "A" antitoxin. The animal did not show any effect from the injection, despite the fact that the dose was 8 times the amount which had proved fatal to horses Nos. 1 and 4.

January 13 a very thin yearling heifer, No. 2069, was given a subcutaneous injection of 20,000 m.l.d. of type "A" toxin. In two days the animal showed weakness, with no effort made to eat or drink. On the third day the animal was down and unable to rise, nose dry, mouth slightly open and saliva dropping. The animal could get up on its hind legs but could not raise the front quarters. Its pulse was 95, temperature 99.0° F., respiration 36. On the fourth day the animal was totally unable to rise. It gradually became weaker, dying on the sixth day.

On postmortem small pieces (about 20 grams) of the liver, spleen and heart clot were placed in sterile flasks and kept on ice over night. The following day they were macerated in salt solution in mortars, and 1 c.c. of each was injected into guinea pigs. This was done to ascertain whether tissues from an animal injected with such a large dose of toxin would be toxic. All the guinea pigs remained normal.

Cattle are, therefore, resistant and probably could consume a very large amount of botulinus toxin by the mouth without effect. That they are not entirely immune is shown by this experimental

animal succumbing to the large dose of the material given subcutaneously.

Field Observations and Administration of Botulinus Antitoxin

The antitoxin was forwarded to veterinarians in several parts of the State where forage poisoning appeared, as well as used by ourselves in several cases. Under field conditions, on account of not being able to ascertain which type of toxin was causing the trouble, it was always necessary to give both types of antitoxin, and in such cases only one-half the total dose administered would be specific. No positive benefit was obtained with the use of this material therapeutically.

In one outbreak at Oxnard 10 horses died of the acute form, after which 5 more animals developed the chronic type of the disease. Antitoxin was forwarded to Dr. A. L. Metz, the attending veterinarian, for these latter cases. He kept the animals in slings and administered subcutaneously 30 c.c. of each type to them every 7 days for 5 weeks. He reported a gradual improvement in the animals, but 2 of them were kept supported in slings for 3 months and the other 3 for 5 months. At this writing they do not require slings to support them, but have not yet gone to work. One is not justified in considering that the antitoxin administered in the manner described above in this type of cases had any therapeutic value.

In one other case, where the material was used by Dr. F. H. Baker, at Gardnersville, Nev., he made the following report to Dr. Edward Records of the Nevada Experiment Station:

"In regard to the mare treated January 12, 1920, for cerebrospinal meningitis: Disease commenced with paralysis of hind quarters, staggering gait, temperature slightly elevated, animal prone unless made to arise. This condition commenced two days prior to treatment, which consisted of the injection, subcutaneously, of botulinus antitoxin, type 'B,' 100 c.c. I did not see the mare again, but was informed by the owner that she had made a complete recovery and was back at work."

On cursory examination this might be considered a case where serum proved of value, but on more careful study several serious doubts make themselves apparent. The elevated temperature renders the diagnosis somewhat questionable. Only one type of antitoxin was used, and as most of the outbreaks in this section of the

country are caused from "A" type toxin, the specificity of the treatment is in doubt.

On December 20, 1919, we received word that horses were affected with the disease at Eugene, Calif., in a barn where forage poisoning had appeared the previous year. Upon arrival at the ranch the following day, two horses were found down with the disease and unable to rise. Each of these was given 200 mils of the antitoxin, from which no improvement was noticed. The animals were well advanced with the disease and died the following day.

The remaining four horses consuming hay from the same barn were given prophylactic doses of 40 c.c. of antitoxin and removed from the suspected feed. In handling these animals it was noticed that one was showing slight signs of the disease by weakness and irregular gait. This animal was given intravenously 200 mils of antitoxin in addition to the prophylactic dose of 40 mils given subcutaneously. The symptoms disappeared and the animal seemed to be normal to observation by the owner at the end of the second day. At the end of a week, on account of shortage of horses, the animal was put in the plow and worked throughout the day. During the evening it commenced to show signs of forage poisoning and was permanently decumbent the following morning and died toward evening. This animal, from the fact that it was later showing symptoms than the other horses, probably received a smaller dose of the poisonous material and might have recovered spontaneously. In such cases where the dose is just lethal, serum, after the early appearance of symptoms, may prevent a fatal termination. Hard work would be expected to aggravate the disease, as in experimental chickens which recover, fatigue quickly occurs for days or weeks after symptoms disappear.

On February 10, 1920, experimental horses Nos. 2 and 3 were placed in the barn where these cases had developed, and were left there for several months on the same feed, without showing anything abnormal. It was therefore evident that, if the hay stored in the barn had been the cause of the loss, but a small part of it must have contained the toxin. This barn contained cracks between the boards where rain could get in and wet hay lying against them. It would seem that such moisture might be the cause of growth of molds and *Bacillus botulinus* in only a small portion of the feed, which accounts for the experimental animals not becoming affected.

On January 15, 1920, we were called to a ranch where two horses had died since January 1 with symptoms indicating forage poison-

ing. At the time of our visit one horse was down with typical symptoms and another had shown slight indication the day before in the form of unsteady gait. This latter animal, however, was much improved and recovered without treatment. The horse that was down received 200 c.c. of antitoxin intravenously. No benefit was noticed and the animal died 48 hours later.

In an outbreak at Chico, Calif., where four horses were affected with the disease, Dr. W. P. Jackson, the attending veterinarian, administered 200 c.c. of antitoxin to two of the animals and the other two were left as controls. One treated horse died first, followed by one control, after which the second treated horse succumbed and finally the second control animal.

The antitoxin has been used therapeutically on four human cases of the disease, all of which resulted fatally.

CONCLUSIONS

From the foregoing series of experiments and observations we conclude:

1. That a fatal dose of botulinus toxin produces a symptom complex in horses, indistinguishable from the symptoms in natural outbreaks of forage poisoning.
2. That spontaneous recoveries from botulism poisoning in chickens do occur even after symptoms are well marked.
3. That recoveries after the administration of antitoxin in field cases can not positively be credited to the therapeutic value of the material.
4. That botulinus toxin in all probability becomes early fixed in the tissues and the therapeutic value of antitoxin is not very great.
5. That its field of usefulness, therefore, will largely be confined to its prophylactic administration to animals on the same feed after one or more cases of the disease appear.
6. That the time following the administration of toxin and the appearance of symptoms depends to a considerable degree on the amount of toxin administered, and that in fatal doses symptoms may not appear for five or six days or longer.
7. When large enough doses are given, symptoms may appear in 24 hours or less.
8. A period of time may therefore exist between the appearance of first symptoms in rapidly developing cases and the first symptoms in late developing but fatal cases, in which the administration of antitoxin may prevent the fatal termination.

REFERENCES

1. J. S. BUCKLEY and L. P. SHIPPEN. Preliminary report of the relation of anaerobic organisms to forage poisoning. Jour. Amer. Vet. Med. Assoc., vol. 3 (n. s.), No. 7, March, 1917.
2. R. GRAHAM, A. L. BRUECKNER and R. L. PONTIUS. Studies in forage poisoning, V and VI. Bulls. 207 and 208, Ky. Agr. Exp. Sta., June and July, 1917.
3. E. VAN ERMENGEM. Untersuchungen über Fälle von Fleischvergiftung mit Symptomen von Botulismus. Cent. Bakt. Parasit., vol. 19, No. 12, p. 442, April, 1896.
4. E. VAN ERMENGEM. Ueber einen neuen anaëroben Bacillus und seine Beziehungen zum Botulismus. Ztschr. Hyg., vol. 26, pp. 1-55; 1897.
5. E. C. DICKSON. Botulism. An experimental study. Jour. Amer. Med. Assoc., vol. 65, p. 492; 1915.
6. E. C. DICKSON. Botulism. A further report of cases occurring in the Pacific Coast States. Laboratory of Experimental Medicine, Leland Stanford Junior University, School of Medicine.
7. E. C. DICKSON. Botulism. A cause of limberneck in chickens. Jour. Amer. Vet. Med. Assoc., vol. 3 (n. s.), No. 5, January, 1917, p. 612.
8. E. C. DICKSON. Botulism. A clinical and experimental study. Monographs of the Rockefeller Institute for Medical Research, No. 8, July 31, 1918.
9. E. C. DICKSON and G. E. BURKE. A method of isolating *Bacillus botulinus* from infected materials. Laboratory of Experimental Medicine, Leland Stanford Junior University, School of Medicine.
10. G. S. BURKE. The effect of heat on the spores of *Bacillus botulinus*. Report of the Botulism Research of the State Council of Defense of California, July, 1918.
11. J. LEUCHS. *Bacillus botulinus* (Immunität). In Handbuch der Pathogenen Mikroorganismen, W. Kolle and A. von Wassermann, vol. 4, pp. 939-946; 1912.
12. W. KEMPNER. Weiterer Beitrag zur Lehre von der Fleischvergiftung Das Antitoxin des Botulismus. Ztschr. Hyg., vol. 26, p. 481; 1897.

In its efforts to hold down hog cholera with a reduced force, the United States Department of Agriculture is putting out a new type of poster. In a sense it is a service chart. Its picture says to the farmer, "When your hog looks like this, look out for cholera." The picture of a hog in colors shows the visible symptoms of the disease. There is printed on the poster information as to how to proceed.

▲ friend who is not in need is a friend indeed.—*Answers.*

LIMBERNECK IN POULTRY¹

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INTRODUCTION

DURING the past two years the Divisions of Poultry Husbandry and Veterinary Medicine have had occasion to observe a number of cases of so-called limberneck in poultry. Some of these cases were sent in by poultry fanciers over the State, some were brought in by local poultrymen, and a few cases were found on the University range.

Many inquiries have been received requesting information regarding the cause and treatment of "limberneck," "wry neck" and "chicken paralysis." The majority of writers refer to these paralytic conditions as a disease, but it would appear to be more correct, in our opinion, to refer to these paralyzes as symptoms of more deep-seated pathological conditions, brought about in all probability by toxins. We shall not attempt to answer this phase of the question, but merely to point out some of the theories and opinions held by scientists and poultry experts over the country, and describe the results of our attempts to produce limberneck in poultry under controlled conditions.

We (R. A. Dutcher and S. D. Wilkins) became interested in this problem after having observed a similarity between the limberneck symptoms in poultry and the paralytic symptoms in our polyneuritic pigeons which had been fed deficiency diets.

Examination of the literature reveals a great diversity of opinion among poultry experts as to the etiology of limberneck. The conviction exists in some quarters that these paralyzes are related in some way to the dietary history of the birds affected. For these reasons the experiments described in this paper were first initiated to determine if such relationships existed.

Since experimental data are meager, we have attempted to collect information from as many sources as possible, including poultry journals, text-books, questionnaires, etc., as well as from scientific sources, with the view of shedding further light on the problem, although it is recognized that some of this information leaves much

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to be desired. The collection of the various opinions held with regard to limberneck in poultry serves to show the need for further work in this interesting and important field.

Theories and Opinions Regarding Etiology

Dietary deficiencies.—Flexner (1) has suggested that the paralytic condition known as limberneck is a neurodystrophy like that of beri-beri, brought about by the feeding of inadequate diets. Kent (2) also argues that diet is an etiological factor, for he observes that the trouble occurs in late winter or early spring after a long period of feeding rations lacking in fresh and succulent foods. Buckley (3) believes that the paralytic condition brought about by feeding polished rice is identical with limberneck, while Conway (4) and Lockett (5) also associate these symptoms with dietary deficiencies. Shepler (6) emphasizes the fact that the composition of the feed is an etiological factor when the feeding period covers an appreciable length of time. She states that "one of the troubles most common in spring or early summer is a disease that so often attacks hogs, calves and sheep after being fed too long on concentrated feed. It has no real name but is generally attributed to indigestion, which really does occur in the beginning, but having known it so long in poultry, I know its true name to be intestinal inflammation due to an overabundance of dry fattening food, hurried on, in the case of fowls at least, by too little water. In poultry the disease is called limberneck."

Botulism.—Dickson (7) has studied the question of "food poisoning" in humans, and concludes that the toxic effect of spoiled food is due to the presence of a toxin elaborated by *Bacillus botulinus*. Portions of these spoiled foods produced limberneck in poultry, according to this writer, and he has therefore advanced the opinion that limberneck in poultry is a form of botulism or food poisoning. Dickson found that chickens are highly susceptible to subcutaneous injections and feeding. He has observed a sluggish movement of the nictitating membrane, sometimes a marked constipation, and usually a general weakness of the bird. Large hemorrhages around the base of the brain and upper part of the cord are practically always present in experimental chickens. Dickson makes the statement that "limberneck is supposed to be due to the ingestion of spoiled meat which is fed to the chickens, but it is known that chickens and turkeys can eat putrefying meat without suffering injury. It is reasonable to suppose that when limberneck symptoms follow inges-

tion of spoiled meat it is *Bacillus botulinus* which is responsible for the poisoning."

Van Ermengem (8) has found that chickens are highly resistant to intravenous, intraperitoneal and subcutaneous injections of botulinus toxin and are practically unaffected when fed large doses. Buckley and Shippen (9) and Graham, Brueckner and Pontius (10) have used chickens as experimental subjects in studying the organism causing food poisoning in horses and mules. The former found chickens refractory to cultures of *Bacillus botulinus* when fed as much as 30 c.c. daily for three or four days, but did find the droppings of these chickens pathogenic when fed to horses and donkeys, which would indicate that the hen is a carrier of *Bacillus botulinus*.

Graham, Brueckner and Pontius fed 6 chickens 45 c.c. of broth culture of *Bacillus botulinus* and the contents of 4 corn-agar slants of the bacillus during a period covering 9 days. During the next 35 days they fed the same chickens 268 c.c. of pork broth cultures of *Bacillus botulinus* and 5 c.c. of the botulinus gelatin culture. These feedings produced no noticeable effects. Burke (11) cites an instance where a jar of string beans, sterilized by the fractional method, was fed to chickens, 24 of them dying of botulism ("limberneck"). Kaupp (12) refers to *Bacillus botulinus* as the cause of true limberneck. In a recent article Hart (13) cites an instance of botulinus poisoning where more than 600 chickens died after eating spoiled canned beans. When the crop contents of the affected birds were fed to other experimental chickens similar symptoms were obtained. No mention was made that *Bacillus botulinus* had been isolated from any of the affected birds.

Parasites.—Pearl, Surface and Curtis (14) state that "limberneck is a symptom due to nervous disorders which arise from several different causes. It is usually associated with colic, acute indigestion, internal parasites or ptomaine poisoning." A prominent Canadian publication (15) advances similar opinions, stating that "limberneck is a disorder of the nervous system. It is usually the result of reflexes caused by disturbances of the digestive organs from severe attacks of indigestion or from worm parasites."

Miscellaneous poisons.—Hawk (16) associates limberneck with the ingestion of decayed flesh "or other indigestible or poisonous matter during excessively hot weather." Husselman (17) and Hicks (18) voice similar opinions concerning "putrid animal mat-

ter," the latter attributing the poisonous effects of decayed meat to ptomaines which have developed in the spoiled food.

Maggots.—Hastings (19) states that limberneck is not a disease but is "the result of eating maggots from dead carcasses," while Ward and Gallagher (20) believe that "limberneck is a symptom resulting from partial or complete loss of control of the muscles of the neck. Feeding on maggots from decaying meat will cause limberneck."

A technical bulletin (21) published by an incubator firm disagrees with this view, holding that "maggots can be fed to poultry in any quantity without danger of causing illness. It is the product of the decaying flesh that causes the mischief, not the maggot that is converting the decay into safe form for food." Boyer (22), on the other hand, is convinced that maggots are the primary cause of limberneck in fowls.

In an attempt to associate limberneck with the ingestion of maggots, a writer from the New Jersey Experiment Station (23) gives a very good description of limberneck symptoms. This writer states: "The chicks within a very few hours would change from a normal healthy appearance and activity to an almost prostrated condition. They would lose the use of their legs more or less completely, lying on their sides and struggling as though they were in great pain. In the worst cases the muscles of the neck seemed to be uncontrollable and the head was thrust forward on the ground. In a few cases visited, the carcasses of cats and dogs were found among the tall weeds on the range. All such carcasses, whatever the source, exposed to the air and flies, soon became filled with maggots or young flies. The chicks eating these maggots were affected in a similar manner to the fowls which had eaten of the decayed flesh."

Saunders (24), who has done more than any other investigator to advance experimental data to prove that flies play an important role in the development of limberneck, states:

The green fly epizootic, as I have formulated the theory of its workings, is propagated as follows: The female insect feeds upon the carcass of a victim, upon its excretions (or the excretions of a case of poliomyelitis) and becomes potentially infected. After three days the ova deposited are toxivirulent. The creature which receives these toxivirulent larvæ, within a few hours, or certainly within a few days, becomes the subject of motor paralysis and death. A chicken died within six hours after swallowing three larvæ. All attempts to inoculate fowls or guinea pigs or other

animals with the blood or tissues of animals dying from ingestion of the specific larvæ have failed. On the other hand, the carcasses of the animals dying—usually within a few hours, sometimes several days after the ingestion of the specific larvæ—never failed to infect green flies so that their larvæ from ova deposited the third day after feeding were toxivirulent. We could kill a young fowl or guinea pig of any age, sometimes within six hours, by the oral administration of a single specific larva. An old rabbit was killed within two hours by the injection intraspinally of a few drops of the filtered emulsion of the specific larvæ. This acute spinal paralysis affects all of the scavengers on the farm and spares the clean animals, and the theory of limberneck resulting from the consumption of carrion has been utterly disproved by our experiments in feeding fowls on putrid flesh, even when seething with maggots. Besides these experiments in the laboratory I have accumulated a large amount of information from all over the country tending to show that it is not putrid flesh nor even maggots in putrid flesh as such, which produce limberneck in fowls, but that maggots grown in the carcass of the fowl or in that of any animal which died of a limberneck virus, are capable of producing speedy paralysis in any animal which devours them."

The fly, *Lucilia caesar*, is conspicuous because of its bright metallic, greenish copper color. According to Herms (25) it is typically a fly of the out of doors and is a very good scavenger. On bright, sunny days we have observed this fly in large numbers on the dung balls of chickens; it is very abundant in hog pens and around rabbit hutches and in some places around guinea-pig cages. We have had no difficulty in inducing this species to come into buildings, especially if a dead animal or chicken has been close to the window. It has been very numerous in the poultry brooder houses on days when hard, steady winds have occurred, and noticeably abundant on rainy days. Herms (26) states that this fly rarely comes into the house and seldom remains long, owing to its rapid response to differences in light intensities.

At one time we observed that the introduction of *Lucilia caesar* into a fly-proof animal cage was followed almost simultaneously by the deposition of larvæ on the carcass of the animal within the cage. This would indicate that this species of fly is both oviparous and viviparous. It is said (27) that *Lucilia caesar* causes cutaneous affections by depositing its larvæ in the skin of man and of animals. Herms (28) gives the following data relative to the metamorphosis of this fly: "Egg stage, 8 to 48 hours; feeding period, 2 to 7 days; prepupal stage, 2 to 7 days, and pupal stage, 8 to 17 days. In the

female the ova are ripe in from 9 to 21 days after emergence from the pupa case." The period of metamorphosis is greatly effected by temperature conditions.

In December, 1919, a case of limberneck occurring in one of the brooder houses at the University Farm was reported to us. Inspection of the house a few days later showed that *Lucilia caesar* was present. This suggests the possibility that this fly may become an inhabitant of houses even in this severe winter climate.

DATA OBTAINED BY QUESTIONNAIRE

At the beginning of our study the following questionnaire was sent to poultrymen, poultry husbandry specialists, poultry journal editors, veterinarians, bacteriologists and others throughout the United States and Canada:

Questionnaire

1. Do you consider limberneck to be due to (a) Dietary deficiencies? (b) Parasites? (c) Bacteria? (d) Consumption of salt or other substance? Upon what grounds do you base your statements?
2. Have you found the disease more prevalent in winter than in summer? In this connection do you consider that an adequate supply of green food prevents the development of the disease? Kindly state what green feeds you have used.
3. What methods of treatment, in your opinion, should be used in actual practice to cure the birds?
4. Have you found the disease more prevalent in young chicks than in mature fowl?
5. Kindly give any other statements relating to the disease which might not strictly come under the above questions.
6. What, in your opinion, is the most authoritative published work concerning this disease?
7. Have you any objections to any information you give being used in any publication in connection with an experimental study of the disease? If you prefer to have your replies tabulated by number rather than by name, kindly indicate such preference.

Ninety-six letters were received in reply to the 126 questionnaires, and approximately 50 per cent stated that the writers had no knowledge concerning limberneck, while but few replies were received in which all of the questions had been answered.

Five people indicated that limberneck was due to dietary deficiencies; nine were of the opinion that the disease was due to bacteria, while four stated that it was due to the consumption of

salt or other substances. Three replies were to the effect that the disease was more prevalent in winter, while twenty stated that more cases were found during the summer and fall months. Fourteen wrote that the disease was found chiefly in mature fowl, and three people found it most prevalent in young chicks.

Twenty replies gave methods for the treatment of limberneck, and these included the use of Epsom salts, olive oil, castor oil, ground onion and dandelion, mixtures of equal parts of olive oil and turpentine, one-tenth grain doses of strychnine given three times daily, bismuth, aconite, asafetida pills, complete change of diet, grass range, and one writer indicated that the only therapeutic agency known to give satisfactory results was "the axe." The term "ptomaine" was used by many in their replies. In the few letters which stated that green food was a factor in preventing this trouble, the use of alfalfa, clover, kale, dandelions and onions was recommended.

The replies to question No. 1 indicate that limberneck may be due to the consumption of (1) decayed potatoes; (2) spoiled lettuce; (3) moldy grain; (4) spoiled canned vegetables, such as corn, beans, peas and asparagus; (5) dead chickens, gophers, cats and rats; (6) spoiled green cut bone; (7) tainted beef scraps; (8) loose smut of barley; (9) polished rice; (10) intestinal parasites; (11) bacteria; (12) maggots; (13) paint skins; (14) spoiled commercial protein feeds, such as cottonseed meal and blood meal; (15) toxalbumose in the larvæ of a specified species of fly; (16) rock salt or other forms of salt; (17) excessive amount of fattening foods.

It is readily seen from the replies to the questionnaire and the data obtainable from the literature that there is considerable difference of opinion regarding the etiology of limberneck.

A number of letters were received in which reference was made to the proper usage of the term limberneck. There seem to be a number of conflicting opinions as to what symptoms ought to be classified as limberneck symptoms. Some of those who returned questionnaires indicated that the condition characterized by a turning back of the head (see figure 1), where the head rested on the back between the wings, was not limberneck. This type of paralysis is sometimes spoken of in poultry literature as "wry neck," and the users of this latter term are generally insistent that the two terms are not synonymous. Others indicated that only in cases where the

head hung down so that the beak might touch the ground could the term limberneck be applied.

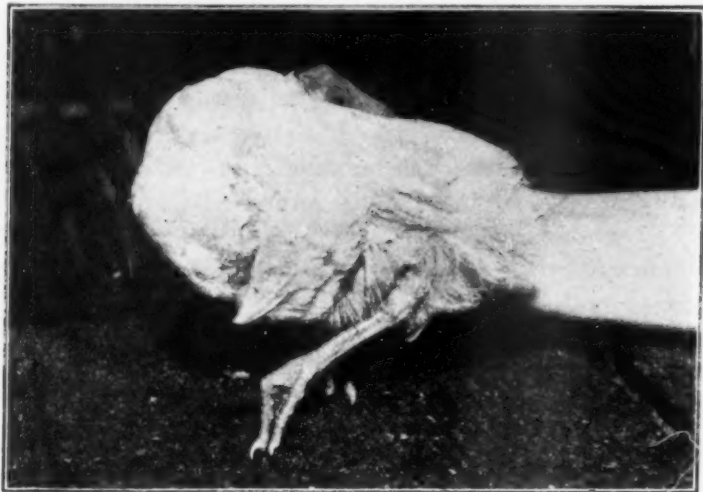


Fig. 1.—White Plymouth Rock Cockerel. A characteristic limberneck symptom sometimes called "wry neck." This chick was found on the University Farm range, July 6, 1919.



Fig. 2.—White Plymouth Rock Cockerel. Same chick shown in figure 1, but illustrating a different type of limberneck as indicated by position of head. Temperature of chick when found on range was 107.0.

We believe from the results of our experimental work that the term limberneck can properly be applied to cases where the head hangs down (29), to those cases where the head is thrown back

between the wings, and to cases where the head is turned to either side through an angle varying from a few degrees to as many as 180 degrees. Since, experimentally, all of these types can be produced in pigeons on the same deficient diet, indicating that the position of the head is dependent upon the particular muscle or group of muscles affected, there should be no confusion in the use

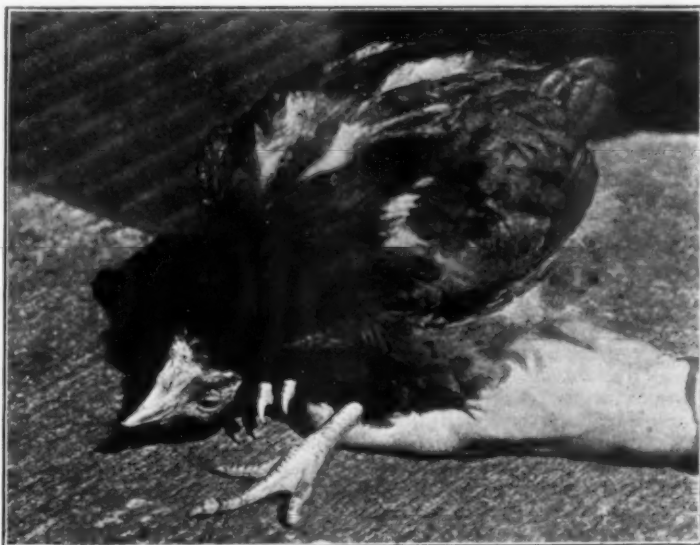


Fig. 3.—Rhode Island Red Cockerel. This photograph illustrates another type of limberneck, the head being turned through an angle of 180 degrees. Its temperature when found in this condition was 106.3. Diet consisted of commercial scratch feed, ground mash feed, buttermilk and succulent green alfalfa. This indicates that an adequate diet does not protect against the onset of limberneck symptoms.

of this term. Figures 1, 2, 3, 4 and 5 illustrate the different types found in this disease.

We have also felt that we were justified in making experiments to test out certain of those views which were substantiated simultaneously by several individuals widely separated geographically. We realize, fully, that too great emphasis can not be laid upon observations made by untrained observers working in the field of practical poultry raising. However, the collected opinions and observations, from all sources, have been of interest and value in bringing out the fact that limberneck occurs quite generally in widely separated sections of the country, and also it is quite evident that a great diversity of opinion exists, even among scientific workers, as to the primary causes of limberneck.

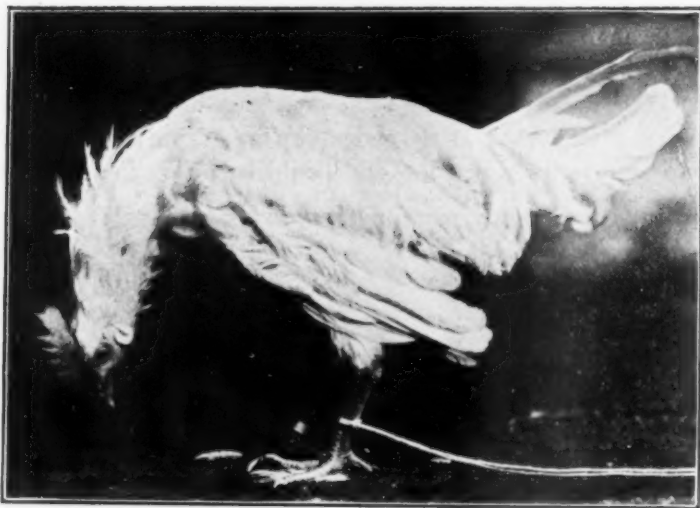


Fig. 4.—Single Comb White Leghorn Cockerel No. 177. Sixty-three days after this cockerel was inoculated with *Bacillus botulinus* culture the symptoms shown in the photograph were observed. The head appendages were pale in color for a few days following inoculation, but no limberneck symptoms were manifest. Since this cockerel presented a normal appearance two days after it was found in the condition shown, it suggests the possibility of consumption of toxic green flies (*Lucilia caesar*).



Fig. 5.—Cross-bred Cockerel. This chick was obtained from a farm where limberneck in chickens, paralysis (of hind quarters) in hogs, and paralysis of the limbs in certain members of the farmer's family occurred simultaneously.

EXPERIMENTAL STUDY

Methods

The chickens used in this study were Single Comb White Leghorn cockerels, 8 to 10 weeks of age and weighing from 450 to 900 grams. These birds were obtained from a commercial egg farm and previous to the experiment had been fed a ration that was ordinarily used on such farms. The necessity of using, for experimental purposes, birds or animals which have been fed rations on which small normal growth has been obtained is of much importance, for, as Laurie (30) has stated, "the thoughtful reader must agree that the presence or absence of certain constituents in the food consumed by man, beast (or bird) must have a *cumulative* even if not an immediate effect."

Hughes (31) has observed that exercise is not an essential factor in the abnormal development of the leg bones of chickens. In order that our birds might be kept under conditions as nearly normal as possible they were placed in well-lighted pens, 4 by 9 feet in size, with a separate roosting closet 3 feet square.

McCarrison (29) has emphasized a point in polyneuritis studies with pigeons which we believe is of importance in conducting feeding experiments with poultry, namely, the segregation of the sexes. This writer segregated 11 pigeons in separate cages, while 20 pigeons were congregated in two large cages. In the former case it required 85 days for the segregated birds to die of the disease and 80 days to acquire it. When the birds were congregated it required but 66 days for them to die of the disease and but 61 days to acquire it. This, he says, "I consider to be due in part to the quieter life led by the isolated pigeons. In the retirement of their cages their metabolic fires burn less briskly, their sexual desires in the absence of the female and the competitive male are less ardent. Thus are conserved the resources of the endocrine glands on which so much of the morbid processes of deficiency disease is dependent."

From our observations in this study we believe that it is equally important where cockerels are used that each bird should be separated. This is especially necessary where the birds vary in age and where one or more of them have reached the age at which they begin to tread. No evidence of treading was observed in the pens of cockerels where the diet more nearly approached the normal, due, perhaps, to the fact that on such a diet all of the birds were equally vigorous and able to hold their own against any other bird

in the pen. In other pens where polished rice was the sole food the larger birds often bothered the smaller ones and removal of cockerels was necessary at times.

The birds were supplied with clean, sharp grit at all times. Water was always available, the water dishes being cleaned daily by washing in a solution of cresol. Clean oat straw was placed on the floor of each pen and was renewed when it had become well broken by the scratching of the birds.

In order that we might have extra birds for future experiments two pens of cockerels were placed on a normal diet. This was composed of whole grain, which they were forced to dig out of the litter, and a dry mash was placed in the hoppers where it was available at all times. The dry-mash ration was composed of equal parts of yellow corn meal, wheat bran, wheat middlings, ground whole oats and beef scrap.

The whole-grain ration was a prepared commercial scratch food supplied by the Poultry Husbandry Division and we have no knowledge as to its composition. That the ration is adapted to the growth of young chicks 6 to 10 weeks of age is evident, since on the normal diet these chicks increased their weight an average of 500 grams in 30 days. No attempt was made to force the growth by feeding wet mashes or by other commercial practices. The weights of our control birds agree with the results reported by Card and Kirkpatrick (32), which show that 10 White Leghorn chicks 15 weeks of age should weigh from 22 to 23 pounds. Eleven of our chicks weighed 29 pounds at 14 weeks of age. These birds were kept confined at all times.

Previous to the beginning of this study, screen doors and windows were placed on the house to keep out flies and other insects. In spite of every precaution flies have been observed in some of the pens. The significance of this is commented upon later.

During the experiment 1,015 temperature readings were made, the temperatures being taken by inserting a high-grade clinical thermometer into the cloaca. Eight hundred and seventeen weighings of the birds were made, and the respiration movements were observed in the case of birds fed on salt, particularly in the cases where there was a characteristic "air hunger" movement.

Dietary Deficiency Experiments

One pen of cockerels was placed on an exclusive diet of polished rice which was supplied them in an automatic hopper so that they

could eat at will. This diet was given for a period of 37 days. The results obtained are given in Table 1.

TABLE 1.—*Variations in weights of cockerels on a diet of polished rice*¹

Day of experiment	Weight in grams						
	No. 164	No. 268	No. 453	No. 485	No. 163	No. 452	No. 487
1	811	489	514	793	768	452	800
4	857	503	431	848	822	486	850
8	872	498	457	838	838	469	799
12	898	474	428	840	849	461	800
16	879	472	422	858	850	476	806
20	718	420	392	822	811	481	800
24	638	437	376	848	813	491	805
28	580	426	300 ²	821	810	480	800
30	529 ³	426	...	801	820	481	800
32	⁴	428	...	831	797	480	818
34	...	411	...	839	798	495	812
36	...	400	...	836	795	496	822

¹ All weights of chicks recorded in this paper are expressed in grams.

² Died, inanition (?).

³ Severe polyneuritis.

⁴ Died, polyneuritis.

On the thirty-seventh day cockerels 452, 268 and 487 were caponized (the right testicle only was removed) and together with the other birds were placed upon a diet of polished rice and green alfalfa. The results obtained during the following 46 days are given in Table 2.

TABLE 2.—*Variations in weights of cockerels on a diet of polished rice plus alfalfa*

Day of experiment	Weight in grams				
	No. 268	No. 485	No. 163	No. 452	No. 487
38	399	856 ¹	805 ¹	498	849
40	375	843	863	502	865
42	²	...	...	...	...
44	...	877	877	509	908
47	...	887	897	516	921
61	...	918	926	517	942
73	...	939	1,110	552	985
77	...	950	1,127	573	990
82	...	982	1,127	578	1,034

¹ Not caponized.

² Died, emaciated.

On three occasions, during the 37 days of rice feeding, the eyes of cockerel 485 became inflamed. We removed at one time a piece of cheesy matter about the size of a navy bean from one eye and washed the eye with a boric acid solution. On both of the other occasions the bird was given 1 gram of butter and within 2 days there was no evidence of soreness, but after a week or more of rice feeding it reappeared. The butter feeding was conducted in an attempt to associate this condition with the deficiency disease known as xerophthalmia, which may be produced in albino rats (33), rabbits (34) and humans (35) by diets deficient in the fat-soluble vitamine. While our results in this single case were encouraging, we hesitate to draw conclusions until we are able to repeat the work on a larger number of birds.

A comparison of the data in Tables 1 and 2 indicates that a considerable increase in body weight of birds fed on polished rice is possible through the addition of green alfalfa to the diet. The significance of green food in the diet will be brought out in a later paper.

Two birds in the pen receiving rice only (Table 1) showed paralytic symptoms. No. 164 became pronouncedly paralytic on the thirtieth day of the experiment and died on the thirty-second day. Its temperature on the thirtieth day was 106.5° , although it had been as low as 105.2° on several previous occasions. A short time before death its temperature was 104.0° . Chick 268 became paralyzed on the thirty-seventh and died on the forty-second day. This bird did not show any paralysis of the neck muscles, but was unable to stand after the thirty-sixth day. Its temperature was 107.4° two days before it died, and 106.1° five hours before death. Progressive lowering of the body temperatures is characteristic of true polyneuritis (29, 36), and is in contradiction to what we have found in the limberneck birds, both those which we have found on the University Farm range, and in birds brought to us, as well as in the cases which we have produced experimentally. McCarrison (29) states that a high temperature immediately before death indicates a bacterial infection, and in his studies of polyneuritis he has used this method as a means of separating the infected from the noninfected birds. He states that where the disease (polyneuritis) is due to the lack of accessory food factors alone there should be no fever.

From the data which we have obtained in the feeding of polished rice as the sole diet of these chickens, as well as of pigeons, we must conclude that there is no relation between the paralysis we

have been able to obtain by such feeding and the paralysis as found in the limberneck chickens with which we have worked.

We have had no cockerels (affected with limberneck) of an age where the reproductive organs were sufficiently developed so that observations could be made, and so can not compare the testicles of limberneck birds with those of polyneuritic birds. We know (29) that in the latter case a decided atrophy of the testicles as well as most of the other endocrine glands is characteristic, but we have no evidence that the same thing is true with limberneck. We have been advised that mature hens affected with limberneck will continue to produce eggs, and there seems to be no reason why there should be lessening of the functioning of the male reproductive organs. Further experiment may show an examination of the reproductive glands to be an accurate method of distinguishing between true polyneuritis and limberneck.

Only in the external characteristics, such as the lack of coördination of movement and the peculiar positions of the head, is there anything in common, apparently, between limberneck and polyneuritis. No further study of dietary deficiencies was made, since it appeared that in polyneuritis and limberneck we were working with two unrelated diseases.

Botulism Experiments

A second phase of our study was to attempt to determine the relation of *Bacillus botulinus* to limberneck. Since no one, to our knowledge, has used in the literature covering their experimental findings photographs of chickens (which have developed limberneck as a result of inoculation with *Bacillus botulinus* toxin or as a result of eating food in which this toxin has been found), we had no previous knowledge as to whether the external symptoms of limberneck (botulinus) corresponded with the symptoms observed in chickens which have been found on the University Farm range or with those which have been brought to us. In our study we have used various strains of *Bacillus botulinus*.

Experiment I.—On July 9, 1919, nine cockerels were fed or inoculated with *Bacillus botulinus*, designated as strain "A." The history of this culture is as follows: Received from Zae Northrup Wyant, of East Lansing, Mich. This culture had been sent to the New York State Board of Health from Harvard Medical School. Growth was obtained in glucose broth by covering the surface of

the broth with a sterile paraffin oil. The culture as sent to us was designated Albany 175. It was not filtered before use.

The chicks in Group 1 were given an intravenous injection (axillary vein) of 1 c.c. of the culture, representing 0.001 c.c. of the original culture. The dosage of chick 466 is uncertain, due to a faulty syringe. Birds in Group 2 were given the same amount of the culture as was given to those in Group 1, but in the second

TABLE 3.—*Weights and temperatures of birds just previous to inoculation or feeding of botulinus culture in Experiment 1*

Group	Chick No.	Weight	* Temperature ¹
1	466	833	106.8
	284	945	107.5
	459	653	107.0
2	469	805	107.2
	187	806	107.1
	177	795	107.6
3	483	883	107.4
	475	892	107.2
	494	885	107.4

¹ All temperatures of chicks recorded in this paper are in Fahrenheit degrees.

instance the material was administered by crop. The birds in Group 3 were given 1 c.c. of the original glucose-bouillon culture pipetted directly into their crops.

TABLE 4.—*Temperature observations ten and twelve hours after inoculation or feeding of botulinus culture*

Group	Hour	Chick No.	Temperature
1	7:30 p. m.	284	106.4
	"	466	107.0
	"	459	107.3
1	10:30 p. m.	284	106.6
	"	466	105.9
	"	459	106.5
2	"	469	105.6
	"	187	105.7
	"	177	105.5
3	"	483	105.5
	"	475	105.8
	"	494	105.6

In general, these birds did not appear different from those which had not received the *Bacillus botulinus* culture. Chick 466 tried to fly to a roost about 6 feet above the regular roost in the pen but gave up after several attempts. Chick 459 reached the high roost on the first attempt. None of the other chicks attempted to fly. Several birds which had not been inoculated or fed on the culture were removed from the high roosts in other pens to see what they would do. Some of these birds made several trials to reach the upper roost; a few of them were successful, and the others gave up further attempts. Since the normal birds behaved very much like those which had been inoculated, no significance could be attached to the fact that most of the inoculated birds either made no attempt to reach the high roost or else failed in most instances to do so.

We found no data relating to the diurnal variations in the body temperatures of chickens. The temperatures of normal birds, both cockerels and laying fowl, were taken at the same time that the observations on the inoculated birds were made. We found that no

TABLE 5.—*Weight and temperature observations of chicks in Experiment I three days after inoculation or feeding of botulinus culture*

Group	Chick No.	Weight	Temperature	
			10:30 a. m.	10:30 p. m.
1	466	860	107.0	105.6
	284	1,013	108.2	105.8
	459	672	106.7	105.8
2	469	865	107.2	105.8
	187	864	107.0	105.4
	177	840	108.0	105.0
3	483	883	107.3	105.1
	475	918	107.0	105.1
	494	883	106.7	105.4

significance could be attached to the seemingly subnormal temperatures of the inoculated chickens (night temperatures), since it was found that the diurnal variations in body temperature of the laying fowl and of the normal cockerels was the same as that of the experimental birds. This variation had a range of from $1\frac{1}{2}$ to as much as 3 degrees in normal birds.

The temperatures of the inoculated birds were taken every two or three hours (approximately) up to midnight, during the following week to ten days. The weights and temperatures (given in Table 5) recorded on July 12 show very clearly the response of these birds to the inoculations and feedings of the botulinus cultures. This table should be compared with Tables 3 and 4.

The chicks in Group 3 made smaller gains than the others, remained in a squatting position for several days after being fed the culture, and all showed much mucus in the mouth, a condition which was not observed in the other chicks. There was no indication of constipation in any of these birds. The chicks in this experiment were placed in a separate pen and observations continued.

On the 14th of July the chicks in Groups 1, 2 and 3 were normal in appearance save for a noticeable paleness in the head appendages, and none of these birds, with the exception of chick 177, subsequently showed any symptoms of paralysis or limberneck. Sixty-three days after inoculation cockerel 177 showed the symptoms as in figure 4. Since this bird was normal two days after it was found in this condition, there is little reason to suspect that this case of limberneck was due to the ingestion of the *Bacillus botulinus*. A discussion as to the probable cause of the paralyzed condition of this bird is given in the latter part of this paper.

Our conception as to the symptoms of true limberneck can best be understood by referring to the figures 1 to 5, inclusive, and comparing these with figure 6, which represents a chicken poisoned with *Bacillus botulinus*.

TABLE 6.—Initial weights and temperatures of chicks and the amount and kind of culture used in Experiment II

Chick No.	Weight	Temperature		Culture	Amount
		2:00 p.m.	10:45 p.m.		
496	1,118	107.7	107.1	Bouillon, crop	1 c.c.
473	1,116	107.4	106.1	" "	" "
166	823	107.0	106.4	Bouillon, subcutaneous	" "
460	834	107.3	107.4	" "	" "
171	827	107.0	108.4	Bouillon, intravenous	" "
174	983	107.2	107.5	" "	" "
297	1,086	107.2	105.4	Agar, crop	" "
492	871	107.9	107.5	" "	" "

Experiment II.—On July 11 eight cockerels were either inoculated or fed on cultures of *Bacillus botulinus*, strain "B," the history of

which is as follows: Received from Dr. Robert Graham of the University of Illinois; other than this we know nothing of its source. The culture was grown in the same manner as that of strain "A." Subcutaneous and intravenous injections were made from the bouillon culture, and both the bouillon culture and an agar culture of the same strain were fed to some of the birds.

Further temperature observations were made during the following two weeks, but the data recorded are not unlike those of the three days immediately after inoculations and feeding, which are shown in Table 7.

TABLE 7.—*Temperature and weight observations one, two and three days after inoculation and feeding botulinus culture in Experiment II*

Chick No.	Temperatures July 12			Temperature July 13, 11:30 a.m.	Temperature July 14, 9:00 a.m.	Weight July 14, 9:00 a.m.
	9:30 a.m.	2:30 p.m.	9:30 p.m.			
496	107.0	108.1	106.2	106.9	107.5	1,112
473	106.7	107.2	105.7	106.2	106.8	1,115
166	107.0	107.9	105.4	107.1	107.4	807
460	107.6	107.9	105.3	107.0	108.2	839
171	106.8	107.4	106.0	106.8	107.1	840
174	106.4	107.7	105.6	107.0	107.2	986
297	106.4	107.2	105.4	106.4	106.5	1,110
492	107.3	107.7	106.2	106.5	107.9	867

On July 18 all of these chicks with the exception of No. 473 had made substantial increases in weight and their temperatures were normal. In all of the birds fed by crop the comb and wattles became almost colorless. None of the other birds showed any indication of abnormal condition. These birds were under observation during the following 90 days, although but a few more weighings and temperature observations were made. None of the chicks in this experiment subsequently developed paralytic symptoms.

Experiment III.—On September 18 four cockerels were used in further experiments with *Bacillus botulinus*. The culture, No. 175-B, was received from Zae Wyant of East Lansing, Mich., with the following history as to its source: "Isolated by the New York State Board of Health Laboratory from home-made cottage cheese which had caused the death of three persons."

The culture medium was made of 1 per cent of glucose bouillon (beef) to which had been added one-third of its volume of cooked pieces of beef. The medium was prepared in 500 c.c. Erlenmeyer flasks. The flasks were inoculated from agar cultures and incubated for six days at 25°C., at the end of which time they were removed.

Two guinea pigs were inoculated with the unfiltered broth culture to obtain a relative idea as to the toxicity of the culture before chickens were inoculated. Before inoculations were made the purity of the culture was confirmed by microscopical and cultural tests.

Guinea pig No. 1 received a subcutaneous inoculation of 1 c.c. of the culture, while pig No. 2 received 0.5 c.c. of the culture in the same manner. Both pigs died within 16 hours. Postmortem examination showed hemorrhagic areas at the point of injection, the area being bathed also with a yellowish edematous fluid. Very few bacteria were observed in smears, but those present were typical of *Bacillus botulinus*.

The dosages given to chickens, together with the initial temperatures and weights and the temperatures on several succeeding days, are shown in Table 8. Since earlier experiments indicated that as much value could be attached to the temperatures taken during the day as could be allowed for those taken at night, none but morning temperatures were recorded.

No further temperature observations were made on these birds, since, from the data previously obtained, it was evident that they were reacting in the same manner. Although the temperature of chick No. 165 fell as low as 104.8°, this bird did not give the slightest evidence that it was not in normal condition excepting perhaps the slight paleness of comb and wattles. Since normal birds of this breed very often show lack of color in the head appendages during hot weather (especially those birds which have a thin, high comb and long, pendulous wattles), no positive significance can be attached to the observations on paleness of head appendages of these inoculated birds.

The two cockerels which received the culture in the breast muscles both gave evidence of being somewhat abnormal, for they were very inactive and in the case of chick No. 188 staggering was observed. The culture used in this experiment was unfiltered. None of these chicks showed symptoms which are at all comparable to the clinical picture as shown in figures 1 to 5.

Experiment IV.—On September 25 an 8-day broth culture of 175-B as grown for the previous experiment, but filtered germ free through a Berkefeld (Mandler) filter, was injected subcutaneously into 6 birds. Sterility of the toxin was confirmed by aerobic and anaerobic inoculations. Previous to inoculating the chickens 4 guinea pigs, each weighing about 350 grams, were inoculated subcutaneously with this filtered toxin as follows: No. 1, 1 c.c.; No. 2,

0.5 c.c.; No. 3, 0.2 c.c.; No. 4, 0.1 c.c.. All of the pigs were dead within 17 hours. No postmortem examinations were made.

TABLE 8.—*Weights, temperatures and dosage of chicks in Experiment III*

Chick No.	Date	Weight	Temperature	Dosage and observations
493	Sept. 18	1,417	108.2	5 c.c. by crop. 2 c.c. injection in pectoral muscle $\frac{1}{2}$ c.c. injection in pectoral muscle 15 grams beef culture by crop
188		1,357	108.0	
497		1,503	108.5	
165		1,500	107.8	
493	Sept. 19	108.3	Staggers
188		.....	108.2
497		.....	108.0
165		.....	107.8
493	Sept. 20	.....	108.0
188		.....	108.5
497		.....	107.8
165		.....	108.2
493	Sept. 21	.....	108.1
188		.....	108.5
497		.....	107.8
165		.....	108.1
493	Sept. 22	.....	105.7
188		.....	105.2
497		.....	106.4
165		.....	104.8
493	Sept. 23	.....	105.2
188		.....	105.5
497		.....	106.4
165		.....	105.0
493	Sept. 24	1,315	106.2	
188		1,197	105.6	
497		1,400	105.1	
165		1,490	106.0	
493	Sept. 25	.....	107.4
188		.....	106.6
497		.....	105.9
165		.....	107.8
493	Sept. 26	.....	107.0
188		.....	106.9
497		.....	107.4
165		.....	107.7

Six chickens, two of which had previously been caponized during an experiment in studying normal development of the reproductive glands of birds, were inoculated and the data shown in Table 9 were recorded.

TABLE 9.—*Temperature and diagnostic observations of chicks in Experiment IV*

Chick No.	Date	Temperature	Dosage and observations
233	Sept. 25	108.1	3 c.c.
270		107.9	2 c.c.
457		107.4	1 c.c.
488		108.4	0.5 c.c.
455		107.5	10.0 c.c.
500		107.3	5.0 c.c.
233	Sept. 26	103.8	
270		104.6	
457		104.7	
488		104.4	
455		105.8	
500		105.2	
233	Sept. 27	106.2	Profuse diarrhea
270		105.2	Slight indication of diarrhea
457		105.8	Apparently normal
488		105.3	" "
455		105.2	Bird unable to stand, comb dark, wings spread at sides, respiration 16 per minute
500		104.2	Bird sits down a great deal but moves more than No. 455. Legs shake when standing; respiration 18 per minute
233	Sept. 28	105.5	Comb dark; head inverted; bird refuses to stand
270		105.2	Bird appears normal
457		107.0	" " "
488		105.0	" " "
455		102.0	Paralyzed on right side; respiration 15 per minute
500			Died during night. Autopsied Sept. 29
455	Sept. 29	96.8	Died during night
233			Died during night

Postmortem examinations were made on the three chicks that died. No hemorrhages were found at the base of the brain; the spinal cord and lungs were normal in all three specimens. There were congestion of the liver and slight intestinal hemorrhages in all three birds.

Chick 270 died October 1. No autopsy was made. Chicks 488 and 457 died November 26. Both were apparently normal, but on November 26 they suddenly became sick and showed symptoms of a general depression. The head and neck remained normal, but the wings dropped at the sides. Both birds suddenly fell dead from the standing position. Postmortem examination showed hemorrhagic areas in the intestinal tract, more pronounced in the duodenum but extending back to the colon and then gradually lessening. The brain and cord were normal in both birds. Cultures from the heart, liver and spleen gave no growth.

Cans of commercially prepared beans, peas and corn were inoculated with culture 175-B. There was no indication of growth in the peas and beans. The can containing the corn was badly bulged and after eight days' incubation was opened and the contents fed to two cockerels. The chicks refused to eat the corn for two days. On October 20 the temperature of chick 217 had dropped to 104.1, while that of chick 242 was 105.0°. October 21 the temperatures



Fig. 6.—Single Comb White Leghorn Cockerel. Fed on spoiled canned corn which had previously been inoculated with *Bacillus botulinus*. This bird remained on the floor in the position shown, and had a low body temperature and low respiration in contrast with the limberneck birds shown in figures 1, 2, 3, 4 and 5.

were 103.6 and 102.7, respectively. Chick 217 died at 4:10 p. m. October 24, its temperature at noon of the same day being 97.2°. Figure 6 is a photograph of chick 242 one and one-half hours before its death. Both of these chicks, after October 20, were paralyzed to an extent where they were unable to stand, and it was with difficulty that they could be aroused from sleep. Respiration became greatly lessened, dropping as low as 17 and 20 per minute.

Feeding Miscellaneous Materials

Another phase of our study related to the consumption of salt, spoiled meat and other substances as possible etiological factors in the development of limberneck.

Six cockerels were fed a sample of spoiled sausage, obtained from the local market. The birds ate voraciously, consuming more than 8 pounds of the spoiled meat in 3 days. No abnormal conditions could be observed in any of these birds.

At about the same time one bird was fed on paint skins scraped from pails of lead-and-oil paints. No record was kept as to the amount of the skin ingested by this bird, but after a few days' feeding the crop of the chicken became packed so that the bird had



Fig. 7.—White Plymouth Rock Cockerel. Photograph of limberneck bird shown in figures 1 and 2, taken three days later. This chick was given a "water-soluble B" vitamine preparation (prepared by extraction of wheat embryo). Administration of vitamine preparation was followed in a few hours by copious bowel evacuations accompanied by increase in appetite and ultimate recovery.

somewhat the appearance of a pouter pigeon. During 19 days' observation the temperature reached a low point of 106.4° and there was a considerable loss in weight, due undoubtedly to the impaction of the crop and the inability of the bird to consume proper food. Its comb and wattles were pale yellow in color and its excreta had a distinct oil and turpentine odor. At no time did this chicken

exhibit any symptoms of paralysis or limberneck which some observers believe to occur in the case of lead poisoning.

The addition of common salt to the mash ration fed to poultry is recommended in most poultry books, and there are no data available showing that in the proportion generally used (about 1 pound of salt to 100 pounds of the ground mash feed) there is any harmful result following this practice. Since there are cases on record of

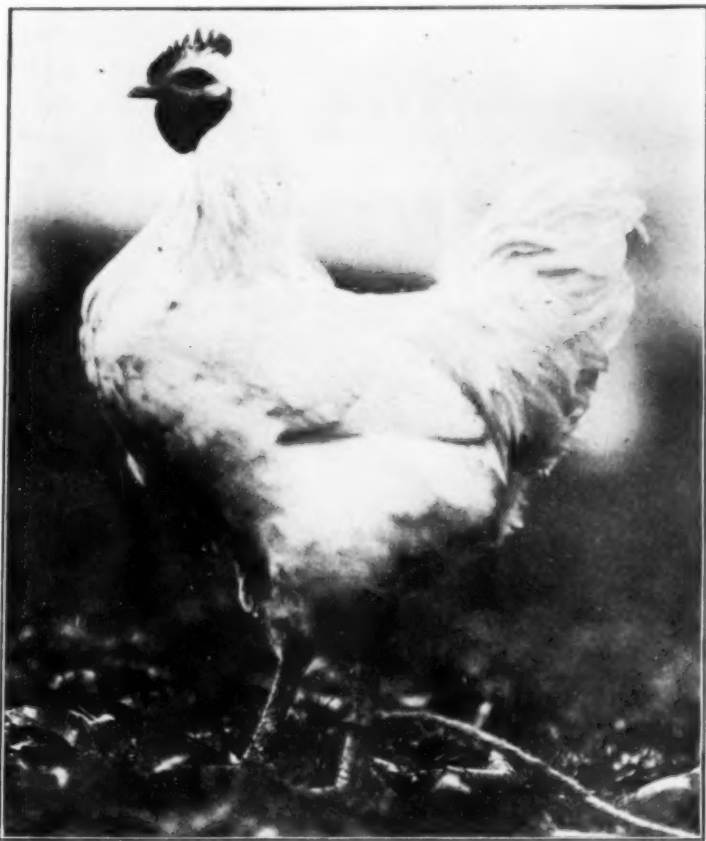


Fig. 8.—White Plymouth Rock Cockerel. This is a photograph of a limberneck bird (see figures 1, 2 and 7), approximately five months after recovery, following the administration of a vitamine extract of wheat germ.

the death of chickens which have consumed salt in the form of rock salt, or have eaten sufficient quantities of dirt on which salt brine has been sprinkled, and the suggestion has been made that limberneck could be produced by salt feeding, we fed to three cockerels (Nos. 465, 471 and 172) 10, 20 and 30 c.c. of salt solution equiva-

lent to 3.18, 6.36 and 9.54 grams of dry sodium chloride. Chicks 471 and 172 were found dead within 8 hours after administering the salt. Chick 465 died 27 hours after being given the smaller dose of salt. All of these chicks showed marked symptoms of "air hunger." The respiration of bird 465 was 16 per minute, in contrast to 50 to 60 per minute in normal birds. There was nothing in the appearance of the birds, which resulted from the feeding of the

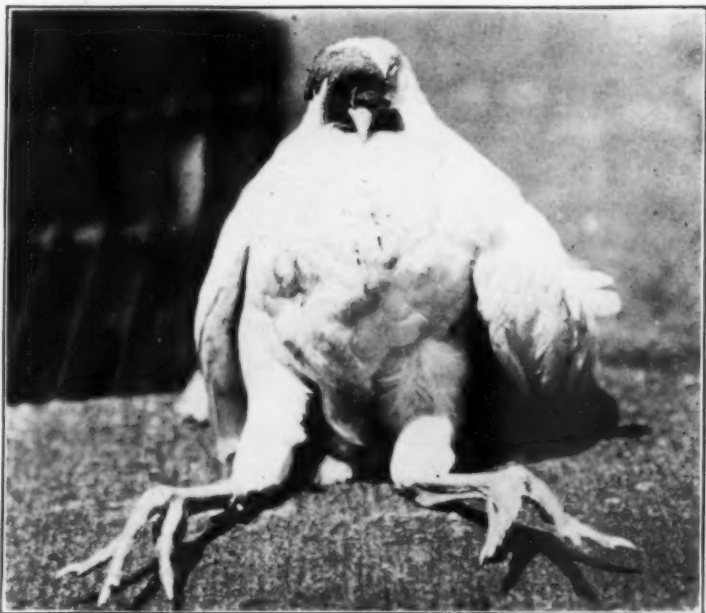


Fig. 9.—Single Comb White Leghorn Cockerel No. 164. This bird showed the typical symptoms of avian beri-beri or polyneuritis after subsisting on a vitamine-poor diet of polished rice for a period of 30 days. Temperature fell to 104.0, while temperatures of limberneck birds tend to remain normal (107.0). Note difference in symptoms between this bird and limberneck chickens in figures 1, 2, 3, 4 and 5.

salt, that would warrant the application of the term limberneck. The temperature of chick 465 was practically normal (107.4°).

We fed varying amounts of loose smut of barley to a few birds without any abnormal symptoms. A large amount of spoiled cottage cheese, as well as several small cream cheeses, were fed to one pen of cockerels, and the birds reacted normally. We got no evidence of poisoning or limberneck when cockerels were fed several cans of spoiled tomatoes, beans, sweet corn, and peas. These materials were obtained from a retail dealer and consisted of cans

known as "swells" in which there was a decided bulging of the ends of the cans. We were unable to obtain spoiled cottonseed or blood meal or tainted beef scrap.

Feeding Fly Larvae

Several writers on pheasant management emphasize the necessity of procuring and feeding maggots to young pheasants, and the experience of one of us (S. D. Wilkins) warrants that practice, for the birds not only grew well, but no losses were observed which could not be explained in other ways.

In order to examine this phase of the problem further, we have fed large numbers of the larvæ of the domestic house fly, *Musca domestica*, of the large blue bottle fly, *Calliphora vomitoria*, and of the green bottle fly, *Lucilia caesar*. Flies were allowed to deposit their ova on fresh beef and the larvæ which resulted were used in the feeding trials. In this manner we fed several hundred maggots from all three species, feeding as many as 700 to one chicken, and in no instance was there any evidence of an abnormal condition resulting from the consumption of the maggots.

Later we caught and introduced into the fly-proof animal cage a large number of common house flies and allowed them to feed on the carcass of a limberneck chicken. We fed the maggots which developed from the ova of these flies, and regardless of the time allowed for the flies to feed and the number of maggots fed, the results were negative with chickens and guinea pigs. We also obtained negative results when the maggots of the large blue bottle fly which had fed on the limberneck chicken were fed to chickens and guinea pigs.

On August 15 the Rhode Island Red chick shown in Figure 3 was found paralyzed in the brooder house at the University Farm. Its temperature was 106.3 degrees. There was a noticeable coryza present. The bird weighed 448 grams. The chick was killed on the afternoon of the same day and placed in the fly cage with *Lucilia caesar*. At the same time we fed two normal White Leghorn chicks on 100 flies each of the same species. Neither chick showed paralytic or limberneck symptoms after eating these flies. (White Leghorn chicks were used because they could be obtained at less cost than chicks of the heavier breeds.)

It is worthy of note that the Rhode Island Red chick which was found paralyzed had been fed and cared for in the same manner as the other chicks in the flock of more than 100. Examination of

the food given to these chicks, in the light of our present knowledge of the vitamine content of certain foods, would indicate that in this case we were not dealing with a vitamine deficiency disease. The chicks had free access to young green alfalfa and other grasses.

Saunders (24) states that White Leghorn chicks will not eat the fly maggots unless the chicks are first starved, but that Rhode Island Red chickens will consume them greedily. To this fact and to the popularity of the Rhode Island Red chicken he attributes the possibility of the spread of poliomyelitis and limberneck. In our work we have had but two limberneck chickens which were not Rhode Island Reds, and these were White Plymouth Rocks. We have not yet found a White Leghorn showing paralytic or limberneck symptoms, but we have been able to produce such paralysis by feeding the larvæ to White Leghorns.

August 21 a large male guinea pig was given two of the larvæ taken from the carcass of the Rhode Island Red chick in the fly-proof animal cage. Eight hours after being fed the two maggots the pig was paralyzed in the hind quarters to the extent that walking was impossible and at this time there was a considerable discharge at the nostrils. Two hours later the pig was dead.

A White Leghorn chick weighing 330 grams and having an initial temperature of 106.4 degrees was fed 22 of the larvæ from the carcass of the chick paralyzed on August 15. During the 10 days following this date (August 22) no paralytic symptoms were observed.

August 24 a female guinea pig weighing 356 grams was given one larva from the carcass of the Red chick at 10:45 a.m. At 8:30 p.m. of the same day this pig was unable to move the hind quarters, and it was found dead at midnight.

On August 24 a large Rhode Island Red hen showing pronounced limberneck symptoms was brought to us. Its temperature was 108.3 degrees, decidedly higher than that of birds exhibiting similar symptoms after eating polished rice for several weeks. This bird's comb was bright red, its eyes normal, and there was not the least indication of emaciation. For some time, at intervals of two days, we gave this hen 25 c.c. doses of a water-soluble extract of wheat embryo, and invariably within a few hours the body temperature dropped from $1\frac{1}{2}$ to 2 degrees. The bird still continued to exhibit convulsive seizures, especially when it was suddenly approached. This hen was killed on September 9 and an autopsy showed that it

was badly infected with a parasite which Dr. W. A. Riley, of the Division of Entomology and Economic Zoölogy, identified as an air-sac mite.

This case presents several interesting points. First, the diet of this bird consisted wholly of stale white flour bread, wheat middlings and oat flour. The bird had been kept confined at all times and got no green feed. Such a diet if continued for any great length of time would produce paralytic symptoms. Second, the high body temperature and the heavy infestation of the air-sac mites confirms McCarrison's (29) findings that avian polyneuritis associated with a high body temperature indicated a concurrent parasitic infection. Third, the maggots of the species *Lucilia caesar* grown on the carcass of this hen did not produce paralytic symptoms when fed to chickens and to guinea pigs.

On September 7 our attention was called to a hog which had died of a paralytic condition which seems to be quite prevalent over the State. This hog was similar to others that we have noted, being completely paralyzed in the hind quarters. The head of this hog was placed in a large screened cage containing a number of *Lucilia caesar* flies. On September 15 100 larvae were taken from this head and fed to a White Leghorn cockerel. Limberneck symptoms developed in a few hours, and in a short time the cockerel was dead. This is the first case of limberneck that we have been able to produce under experimental conditions. While it is known that this paralysis in hogs is quite prevalent over the State, we have not been able to obtain information concerning the dietary history or the hygienic environment of any of these hogs.

Lucilia caesar were allowed to feed on the carcass of the White Leghorn from the above case, and on September 19 213 larvæ were fed to a Rhode Island Red chick weighing 400 grams. This bird died the same day; its temperature shortly before it died was 107.2°. The head of this chick was inverted and the bird attempted to walk backwards. The legs and wings did not show any effect of muscle paralysis. The carcass was placed in the fly cage at once and *Lucilia caesar* allowed to feed. On September 26 a small White Leghorn chick weighing 250 grams was fed 200 of the larvæ. No paralytic symptoms were observed until September 30, when both legs and wings were affected. This chick ultimately recovered. At this time cooler weather made it increasingly difficult to obtain this fly in large numbers and we made no further effort to carry on the experiment.

Whether there is any connection between the finding of chick 177 (figure 4) in a limberneck condition on September 7 and the fact that a hard, steady wind blew directly from a crematory at the University Farm toward the chicken house, and that *Lucilia caesar* were found to be in the house at this time, and also that more than 20 chicks which had access to the carcasses of hogs at the crematory were paralyzed at the same time, it is difficult to determine. Chick 177 had been given 1 c.c. of a 1/1,000 dilution of *Bacillus botulinus* culture, "Strain A," on July 9, and until this date had exhibited no paralytic symptoms. The work of Buckley and Shippen indicates that the chicken may be a carrier of *Bacillus botulinus*. Our own work indicates that chickens are practically immune to inoculations of this bacillus or its toxin; therefore it is difficult to explain this case as due to the previous inoculation. The bird recovered in two days, so that we have no proof as to the causes of the limberneck symptoms.

The question may arise as to why the bird recovered so rapidly, and why other birds in the pen which had likewise been inoculated with *Bacillus botulinus* were not affected. We can only suggest that the severity of the cases of limberneck must depend upon the amount of toxic material consumed, and that other chicks were not affected because they had either consumed nontoxic flies or had eaten no flies. This one case parallels every case we have found at the University Farm, in that limberneck has appeared sporadically and not epizootically.

Observations indicated that the chicks which were feeding in the vicinity of the crematory ate appreciable quantities of the carcasses of the hogs, but there is no reason to believe that they did not also eat large numbers of the flies which were feeding on these carcasses. When the hogs were burned and the crematory cleaned there was no further evidence of paralysis among the chicks.

We realize that the number of chickens with which we have worked in this phase of the study have been small, and that there are many factors in connection with the toxic fly theory of the etiology of limberneck which we have not been able to consider in our experimental work. The fact remains that the only positive results which we have obtained in our efforts to produce limberneck in chickens have resulted from the feeding of larvæ of *Lucilia caesar* which had (previous to their consumption by the chickens) fed upon the carcasses of limberneck chickens or upon the carcasses of paralyzed animals. Pressure of other duties and lack of

assistance required that this work be terminated, for the present at least. We are therefore submitting this material in the hope that it will stimulate others to continue the work.

CONCLUSIONS

1. Limberneck symptoms are not comparable to the symptoms in polyneuritis brought about by dietary deficiencies.

2. Limberneck is undoubtedly a symptom rather than a disease.

3. It was not possible to produce limberneck symptoms in poultry by feeding and injecting the toxins produced by three different strains of *Bacillus botulinus*. The strains were toxic, however, to guinea pigs.

4. Symptoms of botulinus poisoning in chickens differed markedly from limberneck symptoms.

5. It was impossible to produce limberneck symptoms by feeding common salt, paint skins (lead poisoning), smut or spoiled meat.

6. Larvæ which developed from eggs (from *Calliphora vomitoria*, *Musca domestica* and *Lucilia caesar*) laid upon fresh beef were not toxic when fed to chickens.

7. No limberneck symptoms were observed when larvæ were fed which had developed from eggs laid by *Calliphora vomitoria* and *Musca domestica* upon limberneck carcasses.

8. Limberneck symptoms were obtained by feeding larvæ of *Lucilia caesar* which had developed from eggs laid upon limberneck carcasses.

9. Adequate diets do not protect against limberneck in poultry.

10. The body temperature of chickens falls below normal in botulinus poisoning and in polyneuritis (avian beri-beri), but this was not observed to be the case in "limberneck chickens."

ACKNOWLEDGEMENTS

In conclusion we wish to thank Dr. C. P. Fitch for his interest and assistance in obtaining the various strains of *Bacillus botulinus*, and we also desire to express our appreciation to Dr. Robert Graham, Dr. Ward Giltner and Zae Northrup Wyant for furnishing these cultures, and to Dr. W. A. Riley for assistance in the entomological phases of the work.

LITERATURE CITED

1. FLEXNER, SIMON. Quoted from paper of E. W. Saunders (24).
2. KENT, O. B., Department of Poultry Husbandry, Cornell University. Questionnaire.

3. BUCKLEY, J. S., Bureau of Animal Industry, U. S. Department of Agriculture. Questionnaire.
4. CONWAY, THOMAS J., Agricultural and Mechanical College of Texas. Questionnaire.
5. LOCKETT, STEPHEN, University of Nevada. Questionnaire.
6. SHEPLER, IDA. *Successful Farming*, May, 1916, vol. 15, p. 44.
7. DICKSON, ERNEST C. Monograph No. 8, The Rockefeller Institute for Medical Research, July 31, 1918.
8. VAN ERMENGEM, E. Quoted from Dickson's paper (7), p. 63.
9. BUCKLEY, J. S., and SHIPPEN, L. P. *Jour. Amer. Vet. Med. Assoc.*, 1917, vol. 50, p. 809.
10. GRAHAM, ROBERT; BRUECKNER, A. L., and PONTIUS, R. L. *Buls.* 207 and 208, *Ky. Agr. Expt. Sta.*, 1917.
11. BURKE, GEORGINA S. *Jour. Bact.*, 1919, vol. 4, p. 541.
12. KAUPP, B. F. *Poultry Diseases*, 2d ed., 1917, p. 229. American Veterinary Publishing Co.
13. HART, GEORGE H. Botulism in chickens. *Jour. Amer. Vet. Med. Assoc.*, 1920, vol. 10 (n.s.), p. 75.
14. PEARL, RAYMOND; SURFACE, F. M., and CURTIS, MAYNE R. *Diseases of Poultry*, 1915, p. 202. Macmillan Co.
15. Department of Agriculture, Live Stock Commissioner's Branch, Poultry Division, Ottawa, Canada, *Bul.* 9, 1905, p. 9.
16. HAWK, EARL B. *Science and Art of Poultry Culture*, 1909, p. 480. E. B. Hawk, Clinton, Wis.
17. HUSSELMAN, CAL. *Southern Poultry Guide*, 1908, p. 77. Southern Planter, Richmond, Va.
18. HICKS, REESE V. *Tricks of the Poultry Trade*, 1910, p. 55. Poultry Culture Publishing Co., Topeka, Kans.
19. HASTINGS, MILO M. *Dollar Hen*, 2d ed., 1909, p. 120. Arcadia Press.
20. WARD, A. R., and GALLAGHER, B. A. *Diseases of Domesticated Birds*, 1920, p. 154. Macmillan Co.
21. Cyphers Service Department, *Bul.* 21, 1912. Cyphers Incubator Company, Buffalo, N. Y.
22. BOYER, M. K. *American Poultry Advocate*, 1919, vol. 27, p. 271.
23. *Hints to Poultrymen*. Dept. Poultry Husbandry, N. J. Agr. Expt. Sta., June, 1915, vol. 3, No. 9.
24. SAUNDERS, E. W. *Jour. Ark. Med. Soc.*, 1915-1916, vol. 12, pp. 6-13.
24. SAUNDERS, E. W.; MEISENBACK, ROLAND O., and WISDOM, W. E. *Jour. Mo. State Med. Assoc.*, 1913-1914, vol. 10, pp. 305-317.
25. HERMS, W. B. *Jour. Expt. Zoöl.* 1907, vol. 55, pp. 45-83.
26. HERMS, W. B. *University of California Publications*, *Bul.* 215, 1911.
27. PATTON and CRAGG. *Medical Entomology*, p. 325. London, 1913.
28. HERMS, W. B. *Jour. Expt. Zoöl.*, 1911, vol. 10, p. 167.

29. McCARRISON, ROBERT. *Indian Jour. Med Res.*, 1919, vol. 6, p. 290.
 30. LAURIE, DUNCAN FORBES. *Poultry Foods and Feeding*, 1912. Cassell.
 31. HUGHES, J. S. *Kans. Expt. Sta., Tech. Bul.* 5, 1918.
 32. CARD, LESLIE E., and KIRKPATRICK, WILLIAM F. *Storrs Agr. Expt. Sta., Bul.* 96, 1918.
 33. See publications of E. V. McCollum, T. B. Osborne, and L. B. Mendel, A. D. Emmett and J. C. Drummond.
 34. NELSON, V. E., and LAMB, A. R. *Amer. Jour. Phys.*, 1920, vol. 51, p. 530.
 35. Report of Medical Research Committee, London, 1919.
 36. DUTCHER, R. A. *Jour. Biol. Chem.*, 1918, vol. 36, p. 63.
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LUCKY GOES TO TEXAS

To further the study of the Morgan as a saddle breed, the United States Department of Agriculture has sent the two-year-old Morgan stallion Lucky from the Morgan horse farm at Middlebury, Vt., to the Santa Gertrudis ranch at Kingsville, Texas. This is the "home ranch" of the famous King Ranch, one of the largest and best known cattle and horse breeding establishments in the United States. The Bureau of Animal Industry is paying close attention to the saddle possibilities of the Morgan horse. The King Ranch will breed Lucky to some of its high-class mares and make a careful study of the produce.

Lucky is a brown stallion fourteen and three-quarter hands high and weighs 925 pounds. He was sired by Hugo. Hugo was sired by Meteor Morgan and is out of Calve by General Gates. The dam of Lucky is Eunice by General Gates and out of Caroline by Daniel Lambert. Lucky, his sire and dam, and one of his grand dams were bred at the Government farm at Middlebury.

Morgans have always been noted for their endurance and stamina, and have been used to some extent on the range for the production of cow ponies. The outcome of this systematic study in coöperation between the King Ranch and the Bureau of Animal Industry will be watched with much interest by horse breeders.

On mules we find two legs behind,
And two we find before;
We stand behind before we find
What the two behind be for.

—Lafayette Lyre.

STUDIES ON ANTHELMINTICS

X.—Stock Tonics and Some of Their Constituents

By MAURICE C. HALL and MEYER WIGDOR,

Research Laboratory, Parke, Davis & Co., Detroit, Mich.

One of us (Hall, 1917, 1918, 1919) has stated elsewhere the belief that the mineral mixtures or stock tonics commonly employed are of very little value as anthelmintics. This seems to us necessarily true. Potent anthelmintics are too toxic and dangerous to put into these preparations in sufficient amounts to be effective, because these preparations are used by persons unskilled in the handling of potent drugs. Only innocuous substances, usually reputed to be anthelmintic, and often with but little besides the reputation of being anthelmintic, can safely be incorporated in these preparations. Of the feeble anthelmintics used, iron sulphate and common table salt are the favorites. The remainder of the preparations consists for the most part of purgatives, tonics, antacids, flavor and color. We give below some tests in support of the idea that neither the mineral mixtures, stock tonics, nor the iron sulphate and salt that make up a large part of their bulk are dependably anthelmintic. These tests show that these things are not valuable when administered carefully as drugs; they will be even less effective when given in feed to stock and there would be no point to these preparations if they could not be given in feed, as they are essentially designed for this to save the trouble of dosing.

The following experiments with commercial preparations have been briefly abstracted by Hall (1919):

Commercial preparation No. 1, a well-known preparation, was given to dog No. 232; an animal weighing 10 kilos, as follows: The dog received 6 teaspoonfuls of the preparation daily—about half of the dose for a hog—for a total of 14 doses in 16 days, or 84 teaspoonfuls. The dog passed 2 ascarids, and had 10 ascarids and 93 *Dipylidium* postmortem. The treatment was, therefore, about 17 per cent effective against ascarids and 0 per cent effective against tapeworms. At this rate the ascarids would have been removed in 3 months, assuming that it removed 1 worm a week. This is an iron-sulphate and sodium-chloride preparation.

Commercial preparation No. 2 was given to dog No. 327, an animal weighing 10 kilos, as follows: The dog was first given 1

teaspoonful a day, the dose for a 100-pound hog, but as this caused vomiting, owing to the salt, which makes up 95 per cent of the preparation, the dose was cut to $\frac{1}{2}$ teaspoonful, for a total of 10 teaspoonfuls in 19 days. The dog passed no worms and had 1 ascarid postmortem. Treatment was therefore 0 per cent effective.

Commercial preparation No. 3 was given to dog No. 298, an animal weighing 14.5 kilos, at the indicated rate of 1 teaspoonful daily, for a total of 27 doses in 32 days. The dog passed 1 ascarid (after 8 treatments) and on postmortem had 15 ascarids and 18 tapeworms. The treatment was therefore about 6 per cent effective against ascarids and 0 per cent effective against tapeworms.

These experiments show that the stock tonic group has but little anthelmintic value.

To determine the anthelmintic efficacy of salt and iron sulphate the following tests were made:

Common salt was given in a dose of 1 gram in capsule followed by a small amount of water, about a half-ounce, to dog No. 325, weighing 8 kilos. The dog passed no worms and was found on postmortem to have 2 hookworms, 4 whipworms and 3 tapeworms. Treatment was 0 per cent effective against hookworms, whipworms and tapeworms.

Iron sulphate was given to 4 dogs as follows:

Dog No. 37, weighing 2 kilos, was given a 5-grain dose on each of 2 successive days, the first dose accompanied by 5 grains of calomel. The dog passed 1 ascarid and 8 whipworms, and on postmortem had 5 ascarids and 100 tapeworms. The treatment was therefore about 17 per cent effective against ascarids, 100 per cent effective against whipworms, and 0 per cent effective against tapeworms.

Dog No. 45, weighing 8 kilos, was given the same dose, 5 grains, on 4 successive days, accompanied by 2 grains of calomel on the second day. The dog passed no worms and had 1 whipworm postmortem. Treatment was 0 per cent effective against whipworms. There might have been more whipworms; this dog died from an intussusception of the ileum through the ileo-colic valve into the colon, and the specimen was kept intact.

Dog No. 44, weighing 10 kilos, was given 5 grains daily for a total of 13 doses in 18 days, or 65 grains. The dog passed no worms, and on postmortem had 20 whipworms and 11 tapeworms. Treatment 0 per cent effective against whipworms and tapeworms.

Dog No. 242, weighing 16 kilos, was given iron sulphate in doses

beginning at 5 grains the first day and increasing by 5 additional grains daily to a dose of 40 grains. The dog received 8 doses in 9 days, a total of 3 drams and an average dose of 32.5 grains. The dog passed 1 ascarid, and 1 more was found in the large intestine postmortem, and must be accredited to the anthelmintic. It also passed 3 whipworms. Postmortem there were 674 whipworms. The treatment was therefore 100 per cent effective against ascarids and less than 0.5 per cent against whipworms.

From the foregoing we may note that: Salt in the dose given is apparently of no value against hookworms, whipworms and tapeworms, but it would need further experiment to determine just how little anthelmintic value it has. Iron sulphate must be given in very large doses to be really effective against ascarids in the dog. It is of interest to recall that this drug is commonly employed against ascarids in the horse, much more difficult worms to remove. Iron sulphate shows itself effective against whipworms occasionally, but is evidently not dependable, as the results with the large doses given dog No. 242 show. It has no value for removing tapeworms. The commercial preparations—and this is true for other mineral mixtures, as one of us (Hall) has found in tests—are of but little value as anthelmintics. They may have value as appetizers or to supply mineral constituents.

REFERENCES

- HALL, MAURICE C. 1917. (Discussion of papers on parasites at A. V. M. A.) *Am. J. Vet. M.*, v. 12 (9), Sept., pp. 629-630.
1918. *Idem.* *J. Am. Vet. M. Assn.*, v. 6 (3), June, pp. 345-349.
1919. Practical methods of treatment for worm infestation. *J. Am. Vet. M. Assn.*, v. 8 (1), April, pp. 24-45, 1 fig.

Breeder's Gazette says editorially of the opposition to tick eradication in the South: "Individual and organized hostility to the enforcement of the tick-eradication law is open or latent in a few regions of some of the Southern States; but the periodical shifting of the Federal quarantine line toward the southern boundary of the United States is a reassuring pledge that the days of the tick in this country are numbered. The Government's campaign to clean out the pest had been scientifically and economically sound. * * * If all the facts and factors were known, however, we should probably be surprised at the rapidity with which the campaign has progressed toward completion."

ANTI-BLACKLEG SERUM

By M. J. HARKINS and J. E. SCHNEIDER, *Glenolden, Pa.*

In 1893 Kitt¹ working on immunity problems on blackleg developed in sheep an anti-blackleg serum which protected sheep in 5 and 10 mil doses against fatal doses of the virulent muscle virus. In later investigation he showed that goats, cattle and horses when treated with intravenous and subcutaneous injections of muscle juice from blackleg lesions yielded a similar blood serum. Kitt's work was later confirmed by Arloing and also by Leclainche and Vallée. The latter workers extensively used the immune serum alone and in combination with various preparations of the bacillus of blackleg or its products, with remarkably good results. Where deaths from blackleg were reported following the use of the immune serum alone as an immunizing agent they were possibly because the period of immunity following the administration of the serum was not known and the deaths probably occurred when very little or any of the passive immunity existed.

The work here reported is contributed to show the possibility and value of a laboratory test on anti-blackleg serum which may serve to standardize various lots of serum.

The serum was produced in horses by the subcutaneous injection of cultures of the bacillus of blackleg containing toxin, which were fatal for cattle in 1-mil amounts, and the natural aggressin. The two products used in the immunization of the animals were injected alternately 7 days apart. The treatment extended over a period of 20 months. The animals were bled on an average of once every 10 days; the serum was collected from each bleeding and mixed in lots approximating 100,000 mils. Each lot was subjected to the following test:

Protection test.—Six guinea pigs, each weighing 400-450 grams, were used for each lot of serum. Guinea pigs of this weight are more susceptible to blackleg than the smaller 200-300 gram animals, and for this reason were used. Each guinea pig was injected intraperitoneally with 2 mils of the immune serum, and 24 hours later subcutaneously with 6 milligrams of powdered cattle virus suspended in 1 c.c. of physiological salt solution. It was found that this amount of muscle virus would kill normal guinea pigs within 96 hours. At the same time 6 guinea pigs were treated in a similar

¹ Hutyra and Marek. *Pathology and Therapeutics of the Diseases of Domestic Animals*, vol. 1, p. 58.

manner with normal horse serum and powdered cattle muscle virus, and 16 normal guinea pigs received the muscle virus alone. The animals were observed for 96 hours after injection of the muscle virus, and those alive at the end of that time considered survivals and the test finished.

Details of Tests

Serum No.	Guinea pigs injected	Serum injected intraperitoneally	Virus injected subcutaneously after 24-hour interval	Per cent survived
5685.....	6	2 mils	6 mg.	100
84501.....	6	2 mils	6 mg.	100
84502.....	6	2 mils	6 mg.	100
84500.....	6	2 mils	6 mg.	100
85466.....	6	2 mils	6 mg.	100
82721.....	6	2 mils	6 mg.	83.33
90791.....	6	2 mils	6 mg.	100
82996.....	6	2 mils	6 mg.	100
84444.....	6	2 mils	6 mg.	100
87044.....	6	2 mils	6 mg.	100
90792.....	6	2 mils	6 mg.	100
91247.....	6	2 mils	6 mg.	100
6000.....	6	2 mils	6 mg.	100
Controls, normal serum.....	6	2 mils	6 mg.	16.66
Controls, muscle virus.....	16	0 mils	6 mg.	18.75

Of the anti-blackleg serum guinea pigs surviving, of which there were 100 per cent in each lot except one (82721) in which one animal died, no other deaths occurred within 14 days. The one surviving normal-serum guinea pig (16.33 per cent) also lived for 14 days. But of the 18.75 per cent muscle-virus controls that survived 96 hours, all died of blackleg within 7 days after injection of the muscle virus, and at the time the test was considered completed (96 hours) showed enormous swellings at the site of injection with exudation of serous fluid and ulceration. Quite a contrast was presented by the anti-blackleg-serum guinea pigs, a few of which showed only a slight edematous swelling within the first 24 hours, which rapidly subsided.

The general health of the anti-blackleg-serum guinea pigs was not impaired in the least as a result of the test. With reference to the use of muscle virus as an infective agent, in our experience it has proved better than either the culture or the edematous fluid from an infected guinea pig.

SUMMARY

1. The protection test, consisting of the injection intraperitoneally of 2 mls of anti-blackleg serum followed in 14 hours by the subcutaneous injection of a fatal dose of blackleg muscle virus, gave consistent and uniform results.

2. Anti-blackleg serum protected 100 per cent of the guinea pigs injected in 12 or 13 lots tested. In the remaining one lot 83.33 per cent of the guinea pigs injected were protected.

3. Normal horse serum, subjected to a similar test on guinea pigs, did not afford protection against a fatal dose of blackleg muscle virus; only 1 of the 6 animals survived.

4. Blackleg muscle virus proved an efficient agent in the tests.

5. The tests show that the serum tested is high in antibody titre and that passive immunity is imparted to the animal injected to enable the animal to withstand infection of a fatal dose administered 24 hours later.

The Westminster (Md.) *Times* reports the good work of a local veterinarian in this wise:

"Our veterinarian, Dr. H. M. Keller, got a hurried call on Saturday evening to the home of Clinton Garvice tenant on the Dr. Keagy farm near the Mason and Dixon line in Maryland not far from Nace's Mill. He at once made a hurried run to the home where two cows were dead and others dying with every symptom of poison. After findout out the cause he at once set to work to save a fine bull that with locked jaws but with hyperdermics he got the saliva to run freely to which the jaws unlocked and with antidote remedies he saved the bull and five cows."

Pictures of cows of the twenty-sixth century before Christ, found on Egyptian monuments, and pictures of Assyrian horses have been made into stereopticon views by the United States Department of Agriculture, together with pictures of present-day animals for purposes of comparison. These slides have been prepared as a part of a series on better live-stock production for use in the "better sires" campaign. The ancient animals, of course, do not conform to modern standard classifications, but judged on general appearance they would outclass a great many American scrub animals of today.

Breeder's Gazette says of the accredited herd work: "The advantages of the accredited herd are so many that they more than overcome the few inconveniences. It is getting easier to buy cattle from Federal-tested herds as they are getting so much more numerous."

ROSE-CHAFER POISONING IN CHICKENS

By B. A. GALLAGHER, *Washington, D. C.*

Extensive losses among chickens, generally attributed to other causes, result from eating rose chafers which invade certain sections of the country during the latter part of May, June and early July. Several cases of rose-chaffer poisoning have recently been observed in young chickens submitted to the Pathological Laboratory of the Bureau of Animal Industry for examination. In these cases the losses reported ranged from 25 chickens in one flock to 85 in another. Reports of similar outbreaks, however, indicate that the mortality from this cause may run much higher, depending upon the number of birds exposed.

APPEARANCE, DISTRIBUTION, HABITS

The rose chaffer or "rose bug" (*Macrodactylus subspinosus*) is a light ocher or yellowish brown colored beetle about one-third of an inch in length, and has long, spine-covered legs. It is found in the area extending from Canada to Virginia, Tennessee and Oklahoma, and from the Atlantic coast to Colorado. These beetles usually appear suddenly late in May or early in June in the southern part of their range and about two weeks later in northern regions. Their coming corresponds rather closely to the time of blossoming of various garden flowers. They disappear about a month or six weeks after their arrival. Some years rose chafers are much more abundant than in other years, and work great havoc on vegetation, especially on vineyards.

Nearly every form of vegetation is attacked, blossoms, leaves and fruit being consumed. The chafers feed on roses and other garden flowers, ornamental plants, shade trees, shrubbery, grapes and other garden fruits, many garden vegetables, corn, wheat and grasses, also on various weeds and wild plants.

LIFE HISTORY

One generation of rose chafers is produced annually. The length of life of an individual is about 3 weeks, and during this time the male and female are almost constantly paired. The female deposits an average of 30 eggs from one-fourth of an inch to 4 inches below the surface of the ground, usually in sandy soil. The eggs are deposited singly in the walls of small burrows. Larvæ hatch in from 2 to 3 weeks, appearing as yellowish white grubs with

brownish heads. These feed upon the roots of plants until late in autumn, when they burrow deeper in the ground below the frost line. In the following spring they return to near the surface and transform to pupæ. After 2 to 4 weeks the pupæ transform to beetles, which pass out of the soil, mate, and begin feeding on the surrounding vegetation.

SUSCEPTIBILITY OF CHICKENS

Reports of outbreaks, and experiments carried out by Lamson, indicate that chickens over 10 weeks old are not killed by feeding on the insects, although symptoms of poisoning are sometimes produced. Lamson states that from 15 to 20 rose chafers are sufficient to cause the death of a chicken 1 week old; from 25 to 45 are necessary to kill a 3 weeks old chicken, and that 96 killed a 10 weeks old chicken. Apparently the poisonous effect of the insect varies, as autopsies conducted by the writer on chickens ranging from 2 to 8 weeks old disclosed not over 10 rose chafers in the crop of any chick, and as few as 2 insects were found in the crop of an 8 weeks old chick which died from this cause. When rose chafers are numerous, however, chickens will devour large numbers and the crop may be distended and present the appearance of "crop bound."

That deaths are due to the poisonous nature of the insects rather than to mechanical interference is proved by Lamson, who found that a filtered watery extract of crushed rose chafers fed to chickens produced death in the same manner as the insects. When injected into the veins of rabbits in 2.5 c.c. to 4 c.c. doses, the extract caused death in from 55 seconds to 6 minutes. Lamson believes that the poisonous principle is a neuro-toxin which has an effect upon the heart action.

SYMPTOMS

Symptoms may appear as early as one hour after feeding on the beetles. The affected bird becomes drowsy, shows weakness of the legs, and falls over on its side. There may be convulsive movements. Sharp cries are frequently emitted, and retraction of the head and neck over the back of the chicken is quite characteristic. Deaths occur in the period up to 24 hours after eating rose chafers. In the outbreaks observed by the writer deaths followed in from one-half to 1 hour after symptoms were observed. If a sufficient amount of the poisonous principle to produce death is not absorbed the symptoms disappear.

POSTMORTEM APPEARANCE

On autopsy the affected birds fail to show changes in appearance of the alimentary tract or other internal organs, other than an injection of the blood vessels of the heart wall in a minority of the cases. The only diagnostic clue presented is the presence of rose chafers in the crop. These appear darker in color than when observed in the free state, owing to the action of the crop contents on the yellow pigment of their bodies.

TREATMENT

The rapid action of the toxin renders treatment unsatisfactory in birds showing symptoms. An effort, however, may be made to reduce the mortality by administering a purgative to all exposed chickens of the flock as soon as the nature of the trouble is realized. Teaspoonful doses of castor oil containing 15 drops of turpentine would be indicated and may also be given to birds showing symptoms. In a large flock, however, individual treatment would be too slow and tedious, hence the use of Epsom salt would be advisable. This should be given in the proportion of one-fourth of a teaspoonful to each bird under 10 weeks old. The total amount of salt necessary is dissolved in water and mixed in the amount of mash which the flock will readily consume.

PREVENTION

During the period when rose chafers are present young chickens may be kept in inclosed runs or at points where they will not have access to grape vines, rose bushes, shrubbery, vegetables and other flowering plants infested by the insects.

Arsenate of lead and Bordeaux mixture thoroughly sprayed on vines, bushes, etc., before the blossoms appear, and once or twice while the beetles are present, will do much to destroy the pest and prevent serious injury to plants and chickens.

The rose chafer while in the pupal stage may be readily destroyed by plowing and harrowing infested soil during May in the southern range of the insects, and during the latter part of May and early June in their northern range.

REFERENCES TO LITERATURE

- CHITTENDEN, F. H., and QUAINANCE, A. L. The rose chafer: A destructive garden and vineyard pest. U. S. Dept. Agr., Farmers' Bul. 721 (1916).

JOHNSON, FRED. Vineyard spraying experiments against the rose chafer in the Lake Erie Valley. U. S. Dept. Agr., Bur. Ent. Bul. 97, part 3 (1911).

LAMSON, GEORGE H., JR. The poisonous effects of the rose chafer upon chickens. *Science*, n.s., vol. 43 (1916), p. 138.

WARD, ARCHIBALD ROBINSON, and GALLAGHER, B. A. Diseases of domesticated birds. 1920.

DR. E. I. SMITH—AN APPRECIATION

Dr. E. I. Smith, Inspector in Charge of Tick Eradication work in Louisiana for the past five years, has been transferred to Hartford, Conn., to be in charge of tuberculosis eradication in that section of the country.

The severance of Dr. Smith's connection with the work in Louisiana is very much regretted by his fellow workers as well as by members of the State Live Stock Sanitary Board with whom he was brought into such intimate relations.

Through his untiring efforts, Dr. Smith has built up a force, both field and office, of which he may be justly proud, not that he may gain thereby any personal glory, but to the end that the work in general might be more easily and more expeditiously accomplished. The Doctor's first thought has ever been in the interest of his co-workers; ever trying to better their conditions in every way possible.

As a token of esteem, therefore, and to show their appreciation of their chief, the force under Dr. Smith took occasion, on June 29th, the eve of his departure for his new field of endeavor, to surprise him by presenting him with a handsome gold watch and gold fob inlaid with a diamond, the latter being the personal gift of Dr. E. P. Flower, Executive Officer of the State Live Stock Sanitary Board, with whom he had been so closely affiliated in the work of tick eradication in Louisiana.

The watch was the gift of Dr. Smith's official family, and the presentation was made by Dr. E. J. Meixel, Dr. Flower himself presenting the gold fob.

The Louisiana State Live Stock Sanitary Board, through Drs. Dalrymple and Flower, also contributed to the main gift.

Dr. Smith, who was taken entirely by surprise, was very much affected by the thoughtfulness and appreciation of his friends, which they had expressed in such a handsome manner, responded in a most feeling way, but with considerable difficulty, owing to the circumstances which prompted the occasion.

W. H. D.

BACILLUS BULGARICUS IN THE TREATMENT OF INTESTINAL TOXEMIAS OF DOGS¹

By O. A. LONGLEY, *San Francisco, Calif.*

Cases of intestinal toxemias constitute a large percentage of the practice of veterinarians engaged in treating small animals, therefore any factor bearing upon successful treatment should be of interest.

The symptoms presented as the result of overfeeding and lack of exercise, especially in small house dogs, are so common and familiar to veterinarians that there is no need of reviewing them here. The symptoms presented vary and are usually accompanied by either constipation or diarrhea. Treatment usually consists of a laxative, antiferments, carminatives, emollients, and various mixtures intended to correct or stimulate digestive processes, all of which are used with varying results.

Conclusive clinical evidence indicates that the symptoms presented are caused by the absorption of toxic products resulting from the action of putrefactive bacteria in the intestinal tract. Extensive bacteriological processes are going on all the time, which is shown by the fact that, after drying, about one-fourth by weight of the feces of a dog in normal health consists of the bodies of bacteria. Of the various species of bacteria inhabiting the intestinal tract, fully one-third are putrefactive organisms which act upon protein food. During the process of normal intestinal digestion the protein molecule is broken down by the digestive enzymes into amino-acids which are absorbed and assimilated. When, however, the growth of putrefactive bacteria in the intestine is excessive, the amino-acids are decomposed into products that may be and often are toxic in character. If the production of such toxic products is continued for any length of time, normal resistance is overcome and the various symptoms, more or less serious in character, are presented.

Rational treatment therefore should consist of removing the cause by inhibiting the growth of putrefactive bacteria without further lowering the vitality of the patient. This can be accomplished by the administration of *Bacillus bulgaricus* in pure culture.

It has long been known that the growth of certain organisms will inhibit the growth of others. This fact has been practically applied

¹ Paper presented at meeting of California State Veterinary Medical Association, Los Angeles, June 17, 1920.

in clinical medicine by the use of *Bacillus bulgaricus* to prevent the development and activity of putrefactive bacteria in the intestinal tract. This method of treatment is being used by many veterinarians, who report more prompt and satisfactory results than have heretofore been obtained by the old-line treatments.

Putrefactive bacteria do not thrive in an acid medium. *Bacillus bulgaricus* is harmless to the patient, and produces about 3 per cent lactic acid during its growth and multiplication, which is also harmless. The therapeutic value of *Bacillus bulgaricus* is therefore readily recognized in the treatment of cases arising from the absorption of toxic products by the growth of pathogenic bacteria which create putrefaction in the intestinal tract.

Bacillus bulgaricus is a strong individual and thrives well in the intestines. It is claimed that it exerts a favorable influence in destroying putrefactive bacteria other than by the production of lactic acid. Metchnikoff has shown that putrefactive bacteria will not multiply in the presence of the actively growing *Bacillus bulgaricus*, as conditions are produced that are unfavorable to their growth.

DOSAGE

One teaspoonful (4 or 5 c.c.) constitutes an average dose. In acute affections a dose should be given every one or two hours until definite improvement is noted, after which a dose three or four times daily will suffice. Sufficient should be given to bring about an excess of *Bacillus bulgaricus* in the intestinal tract, for thereby the most prompt and satisfactory results will be obtained. Since *Bacillus bulgaricus* is nonpathogenic, large doses of the culture may be administered at frequent intervals without any untoward effect.

Bacillus bulgaricus in pure culture is marketed in liquid form in a special medium that insures its viability for a period of about six weeks, each package being clearly stamped with the date after which it should not be used. To maintain its uniform activity and insure full therapeutic value during this period it should be kept cold, preferably in a refrigerator. Two styles of packages are available—a 3-ounce bottle and a package consisting of twenty 5 c.c. vials or tubes, each tube constituting a dose.

Dr. David Warnock is now Deputy Minister of Agriculture for the Province of British Columbia and any communications addressed to him at Victoria, B. C., will be safely delivered.

TRAUMATIC INDIGESTION AND PERICARDITIS IN CATTLE¹

By C. H. STANGE, Ames, Iowa.

It may seem that the subject of this paper really includes two separate and distinct conditions. To a certain extent this is true, but inasmuch as it is desired to draw especial attention to a few of the most important factors concerning traumatic pericarditis, it is not possible to eliminate the subject of indigestion. These conditions, while not of the same significance as some of our infectious diseases, which are responsible for enormous economic losses every year, are nevertheless sufficiently prevalent among milch cows to warrant your attention for a few moments.

The pathology of this disease will not be especially considered in detail, and only those changes will be mentioned which have a bearing on the symptoms. My reason for approaching the subject in this manner is because, while the pathology is interesting, it is nevertheless very much more important in such cases that we be able to recognize the disease in its earliest stages, when traumatic indigestion is leading to pericarditis, as I am assuming in this paper; for, unless early diagnosis can be made and some satisfactory relief given, there is nothing left, in most cases, except a carcass and a bill for services rendered.

CAUSES AND LESIONS

While both sharp and dull objects are frequently swallowed by cows, I shall limit myself to those which penetrate the wall of the stomach and produce injury to it as well as to neighboring structures; therefore objects such as wire, nails, pins, etc., should be kept in mind in this connection.

While penetration of the wall of the reticulum, which is the compartment almost invariably concerned, takes place, the nature of the injury resulting depends to a large extent upon the character of the foreign body and the rapidity with which it is progressing in the tissues. If blood vessels of considerable size are severed there will be sufficient hemorrhage to be of diagnostic value when the feces are examined. Usually when the serous membrane is reached, peritonitis, usually localized, results and adhesions take place. Further penetration into the diaphragm leads to inflammation of the

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diaphragm. Advancing forward, the object proceeds immediately to the pericardial sac, producing an inflammation of this structure. The progress of the object may be so slow that acute symptoms may not develop until the last stages. The nature of the infection carried by the foreign body will determine, to a large extent, the degree of inflammation. It is readily apparent, therefore, that the path of the foreign body may quite easily be traced by the inflammatory processes which later develop into connective tissue structures.

DIGESTIVE DISTURBANCES

The most common symptoms of traumatic indigestion are those of gastro-phrenitis caused by sharp foreign bodies penetrating the wall of the reticulum and diaphragm.

The usual clinical feature is somewhat as follows: Without any apparent cause, digestive disturbances suddenly appear which frequently resemble the symptoms in intestinal invagination, accompanied by acute colicky attacks, striking at the abdomen, tramping back and forth. In other cases there may be simply symptoms of acute catarrhal gastritis. Following this there is usually a series of more or less chronic periodically recurring gastric disturbances of a very changeable, inconstant character, in which chronic tympanitis plays a leading part and which is of great diagnostic significance. Furthermore, it does not yield to any of the accepted treatments for indigestion.

The points of principal diagnostic value are as follows: The animal at times shows quite marked indications of pain, manifested by groaning, especially following feeding, while lying down, while getting up, uneasiness, and tendency to lie down when being driven. The movements are cautious and performed with a degree of tenseness. The countenance reveals anxiety and pain. The attitude indicates pain, as shown by humped back, turning out of the elbows, pain on palpation over the reticulum and not infrequently over the rumen. If the inflammation of the diaphragm is more or less acute, palpation over the loin and border of the ribs where the diaphragm attaches will be painful. The same condition makes inspiration, and generally any movement, painful, and is usually accompanied by groans. On account of pain the animal dislikes to strain, which frequently leads to constipation, and, as already indicated, the feces should always be examined for internal hemorrhage. The movements of the rumen in most cases are usually quite limited, and this leads to tympany.

While the objects may pass in other directions and not produce pericarditis, the latter is most frequent and is the one under consideration here. We have, however, found foreign bodies in the liver, lungs and other structures.

CARDIAC SYMPTOMS

At the beginning the heart beat is strengthened, palpitating, bounding, and frequently so tumultuous that it may be heard three or four steps from the animal. Frequently there is a secondary beat, not unlike an echo. Later, especially if considerable exudate is present, the heart beat becomes almost imperceptible. Percussion in the region of the heart is painful and, depending upon the quantity of the exudate, reveals an area of dullness of varying size. If the inflammatory process of the pericardium is still in its first stages, friction sounds may be heard; later the fluid produces splashing sounds which vary greatly.

RESPIRATORY SYMPTOMS

The compression of the auricles together with the weakening of the heart leads to passive congestion of the lungs and increased respiratory frequency, causing dyspnea, which is much exaggerated by exercise. These symptoms may become more or less prominent and should not lead one to overlook the essential cause of the difficulty.

JUGULAR VEINS

The same cause of passive congestion of the lungs leads to the filling of the jugular veins and a venous pulse. As this develops, edematous swellings may appear along the neck, and, if the head is lowered much, about the head, and may later involve other dependent portions of the body. This symptom is quite characteristic of traumatic pericarditis.

GENERAL SYMPTOMS

The irregularity and irritable condition of the heart of course is noticeable in most cases in the pulse, which becomes very frequent, weak and often thready. The temperature is variable; it may go up to 105 or 106. Temperature of the surface of the body is changeable. Some regard this as having considerable significance. Symptoms in the later stages become very grave and include, in addition to those already enumerated, a marked disinclination to move, cyanosis, edema, and in some cases indications of pyemia. Parturition usually aggravates all the symptoms.

TREATMENT

Treatment, of course, is unsatisfactory, so far as medicinal agents are concerned. An early diagnosis is important in order that it may be determined early in the course of the disease whether slaughter is advisable or surgical operation should be attempted.

In a few cases it is possible to remove the foreign bodies by surgical procedure and bring about recovery. I wish to describe briefly one case which was operated upon with satisfactory results. No doubt many other cases could be treated in the same manner, provided a diagnosis is made in the early stages and prompt action taken. The patient was a Holstein cow on the college dairy farm. She was at the height of her milk-producing period. A call came to the Veterinary Division the day after the first noticeable symptoms of indigestion became apparent. Respiration and temperature were normal. The pulse was 90 and quite marked in the jugular furrow. Animal refused food. Two days later the respirations were 18, temperature 102.1, pulse 108. The heart beat was tumultuous and could be heard several steps from the animal and felt by placing the hand upon almost any part of the body. There was quivering of the muscles back of the elbow, which, by some, is regarded as diagnostic. There was considerable edema, especially in the jugular furrow. It was decided that any operation which gave promise of success at all was justified, because drugs were useless and any other measures without hope.

The operation was performed with the animal in a standing position, and rumenotomy was carried out according to the accepted procedure. The hand was introduced into the rumen, and by following the wall of the rumen downward and forward the reticulum was entered, and a careful examination of its anterior surface revealed the presence of a nail which was buried in the tissues practically up to its head. It would seem that such an object would be hard to locate, but inasmuch as the lining of the reticulum is rather loosely connected to the muscular coat, and is quite movable, the attached point produced by the entrance of the nail was readily located. After removal of the nail complete recovery took place. The most unsatisfactory part was the difficulty in securing healing of the rumenotomy wound.

In beef or grade dairy animals in good condition it may be advisable to slaughter. The principal object of this paper is to emphasize the necessity of an early diagnosis and prompt steps, either in the form of an operation or slaughter.

URTICARIA¹

By H. G. MCGINN, *Aitkin, Minn.*

Urticaria is a disease of the skin characterized by the development of wheals or patches which appear and disappear suddenly and are accompanied by great itching and burning. The eruption may take the form of papules (urticaria papulosa), vesicles (urticaria vesiculosa), or may be associated with hemorrhage (urticaria hemorrhagica), a condition found in the cutaneous form of hemorrhagic septicemia of the various animals. Urticaria associated with great subcutaneous or submucous edema is regarded as a form of giant urticaria in which the edematous swellings cause no particular symptoms unless in the larynx would produce dyspnea or if in the intestines would produce either vomiting, colic or diarrhea.

The wheals above mentioned are caused by capillary dilation and serous exudation in the corium (skin) and stratum mucosum (or four layers of the epidermis, s. corneum, s. lucidum, s. granulosum, s. mucosum). Generally urticaria is manifested by sharply defined flat, raised swellings of the skin, the result of a quickly occurring serous transudation in the papillary bodies of the corium. It is therefore regarded as a circumscribed edema of the skin which has only reached the point of exudation of serum and not of infiltration with cells. The rapid disappearance of the rash is probably due to resorption of the serous fluid. The cause of the transudation of fluid is due to a sudden dilatation of the capillaries, thereby producing an abnormal excitement of the peripheral vaso-motor nerves which may be due to skin irritation or may be of internal origin.

Urticaria causes neither the formation of abscess nor the swelling of glands; the tumors produced are benign. The causes of this condition may be either external or internal. Among the external causes may be the application of some irritating substance upon the skin, such as turpentine, etc., or it may be caused by the sting or bite of insects. As to the internal causes, it is probably due to some disturbance of the vaso-motor nerve system caused by some irritant taken into the blood which has a peculiar effect upon the skin. In disturbances in the intestinal canal certain abnormal products of decomposition and digestion (toxins) are absorbed by the blood and excreted by the skin, producing inflammation. In certain animals, especially in young, full-blooded, well-fed animals, there

¹ Paper presented at the Twenty-third Annual Meeting of the Minnesota State Veterinary Medical Association, St. Paul, January, 1920.

seems to be an individual susceptibility to the action of certain foods which may be supposed to cause urticaria. Among the exciting causes may be mentioned shedding of the coat, sudden changes in the weather, unwholesomeness or sudden change of food, and rapid cooling of the skin when the body has been overheated. It therefore occurs in the spring and summer, following exhausting labor or rapid movement. In such cases it is due to retention in the body of injurious matter as result of chill, rather than by direct influence of the same upon the skin. In a great many cases it is impossible to attribute the occurrence of urticaria to any specific cause.

SYMPTOMS

The symptoms are characterized by the rapid appearance of a flattened, elevated patch upon the skin, which in the course of a few hours will spread over a large area. At first the patches are isolated, and over them the hairs appear rough. These patches multiply and form quickly and often coalesce, forming large swellings, giving the animal a very unsightly appearance. These swellings appear upon the neck, shoulders, flank, buttocks, and in some cases the limbs, thighs, head, etc., are affected. This condition is chiefly important in connection with the horse because it may change the color of the hair and leave a dark skin spotted with gray or white hair, especially in cases of ten days or so standing. The swellings are sometimes met with in the visible mucous membranes of the mouth, nose and vagina. Their appearance in the mouth leads to disturbance of mastication; in the nose to a disturbance of respiration, and in the vagina to difficulty of urination.

Other disturbances of the general health are symptoms of slight fever, weariness, depression, and disinclination to move about or work. Symptoms of gastro-intestinal catarrh, loss of appetite, diarrhea and constipation are observed, as well as outbreaks of sweating. In some cases the eruptions vanish as quickly as they appeared, say in 24 to 48 hours. Some animals are prone to several attacks in one year.

It is quite evident that urticaria in the majority of cases is merely a symptomatic exanthema and should be cited only as an accompanying symptom of the particular disease with which it is associated, as it is often the only visible phenomenon and the internal complaint can not in all cases be positively demonstrated.

DIFFERENTIAL DIAGNOSIS

Urticaria may be confused with various other affections of the skin, such as eczema, because this term is now applied very generally to eruptions of all kinds that depend on internal disorders or constitutional conditions and that tend to recurrence. The symptoms of eczema are characterized by the formation of blisters which break and discharge a straw-colored fluid, and the location is usually the limbs, although the eruption may appear on any part of the body. In pruritis there is a tendency toward the formation of pimples, vesicles or abrasions, especially about the roots of the mane tail.

Herpes, another condition of the skin, is characterized by the formation of vesicles in clusters or groups with little tendency to break, but dry up into fine scabs. The duration of these eruptions is of longer standing than in true urticaria.

Erysipelas, which is a specific contagious disease caused by a bacterial poison, is characterized by spreading dropsical swellings of the skin, and is attended by general fever.

Purpura hemorrhagica, an acute infective disease, the cause of which is unknown, may be characterized by the petechial spots occurring on the mucous membranes of the mouth, eye and nostrils. This condition is usually a sequel to some previous attack of influenza, etc., although it may occur in the absence of any previous disease, from causes such as being in poorly ventilated stables, among poorly fed animals, or in horses subject to exhausting labor.

TREATMENT

Treatment is usually superfluous. In many cases fasting and warm covering suffice. In cases of any gastric or intestinal disturbance, treatment should consist of purgatives, daily doses of artificial Carlsbad salts, fasting or cutting down on the daily ration, as well as the application of an astringent solution to the swellings.

Dr. George Hilton, Chief Veterinary Inspector of Canada, has just completed a lengthy visit in the Canadian Western Provinces. He reports that in their mange area, where the compulsory dipping has been in progress, all cattle have been dipped twice. All the dipping solutions have been carefully prepared and the cattle were put through at a temperature ranging from 110 to 120 degrees Fahrenheit. Therefore no serious trouble in future with this disease is anticipated.

TUBERCULOSIS CONTROL IN PENNSYLVANIA¹

By SAMUEL E. BRUNER,

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Koch isolated the tubercle bacillus in 1882. Ten years later Dr. Leonard Pearson applied the first tuberculin test in the United States on a herd in Pennsylvania. The Pennsylvania Live Stock Sanitary Board, now the Pennsylvania Bureau of Animal Industry, was created in 1895. From 1896 to January 1, 1920, there were tested under its supervision 746,248 cattle, of which 36,577, or 4.7 per cent, reacted. This does not include herds tested under the officially accredited plan. The cattle tested may be divided into six classes, as follows:

1. Imported into Pennsylvania.
2. Sold into other States and intrastate movement.
3. Certified dairies, herds to comply with municipal ordinances, and private milk companies.
4. Owners who desired to test one or more animals. Subsequent tests, if made, applied at irregular intervals.
5. Breeders who desired to establish tuberculosis-free herds.
6. State institutions.

The results obtained varied according to the class of cattle tested. Our bureau regarded tuberculosis eradication as a practical and economic proposition prior to the adoption of the officially accredited plan. This is proven by the results obtained under the direct supervision of the Pennsylvania Bureau of Animal Industry in the herds at State institutions, as well as in a large number of privately owned herds.

In order to accomplish satisfactory results, considerable difficulty was experienced in certain of these herds. For a number of years it was thought that one subcutaneous test was sufficient to remove all diseased animals from an infected herd. Actual results obtained in a large number of herds tested indicated that one test was not sufficient to detect all reactors. From experiments conducted by the Pennsylvania Bureau of Animal Industry, it was found that a tuberculous animal was tolerant to tuberculin one day, while at a subsequent date this animal would react, even with a minimum dose of

¹ Paper presented at the annual meeting of the Pennsylvania State Veterinary Medical Association, Harrisburg.

tuberculin. This may account for the occasional apparent inefficiency of the subcutaneous test. It was difficult to arrive at the percentage of those which passed a successful test, but on autopsy revealed visible lesions; and owing to the high percentage of reactors which showed no visible lesions on autopsy, it was decided in 1912 to increase, if possible, the efficiency of tuberculin tests; in other words, how to test properly and effectively herds which as the result of the first test showed more than 10 per cent diseased, also herds in which reactions continued to occur on subsequent tests.

The experimental work referred to, conducted by our bureau with the satisfactory results obtained in herds tested in the field, demonstrated the value of the combination test as a practical proposition in tuberculosis control. Had the combination test not been applied on herds maintained at State institutions and in many privately owned herds, those herds would not be free from tuberculosis today. Although we have used the combination test in Pennsylvania since 1912, we do not, however, want to leave the impression that the subcutaneous method alone has not in many instances freed herds from tuberculosis and kept them clean. But the combination tests are necessary and are indicated in a certain class of herds, in order to obtain the best results.

As a concrete example, a herd of 100 cattle was tested by the subcutaneous method, when 39 reacted and 13 were suspicious. The balance of the herd, including calves and suspects, or a total of 74 animals, were retested with subcutaneous, ophthalmic and intradermal tuberculin. The 13 suspects reacted, also 21 others that were negative to the initial test. All but 4 were slaughtered, and all showed lesions.

There are times when the combination test is of little value, but this is the exception and not the rule. To show the efficiency of the subcutaneous test, recently a herd consisting of 19 animals was tested by the subcutaneous method, and 12 reacted. A combination test applied to the balance of the herd, or 7 animals, showed that they were negative to all three tests.

Combination tests are indicated (1) when an initial test reveals a large number of reactors; (2) when retesting suspects, as well as cattle that have received several injections of tuberculin within a short period; (3) herds which have been retested a number of times and one or more tuberculous animals are removed after each test; (4) retesting additions to herds, especially animals which originate in herds where a large number of reactors are obtained;

(5) where it is impossible to obtain any history of the herd from which the added animal came.

The efficiency of the ophthalmic and intradermal tuberculin seems to be increased when used in conjunction with subcutaneous tuberculin. There are instances, however, when ophthalmic and intradermal tuberculin can be used alone to good advantage. It was observed, while carrying on this work, that many animals (calves) too young to inject with subcutaneous tuberculin at the time of initial test, would, when they became old enough to test, react to subcutaneous tuberculin. It was then decided to subject the calves, regardless of age, to the intradermal and ophthalmic tests at times of applying the initial subcutaneous test to the mature cattle.

The results obtained in many herds demonstrated that the combination retest can be applied safely and effectively seven days after the initial test. We might add that the seven-day retest was used in eradicating the disease from a number of State institution herds, also from a number of privately owned herds, where reactions were obtained in subsequent tests. These herds have since passed at least two successful annual tests.

As an example of the value and efficiency of the seven-day retest, our bureau recently received a report covering a tuberculin test of 9 animals sold into another State. The subcutaneous test showed 4 positive reactors. The balance were regarded as more or less suspicious. A seven-day retest was applied, using the combination test, with the result that all suspects reacted to one or more of the tuberculins. In addition to the efficiency of the seven-day retest in this case, our bureau was able to give the owner an early decision regarding shipment. Furthermore, it enabled the bureau to detect earlier and to remove more promptly the diseased animals that escaped the initial test. It was also a great advantage to the owner, in that he was not obliged to feed diseased cattle for so long a period.

The officially accredited plan does not permit a seven-day retest. Retests under the plan can not be applied within 60 days.

Usually the combination test is applied in the following manner: Intradermal tuberculin is injected in the left caudal fold. At the same time the eye is instilled with a 4 per cent ophthalmic solution or one ophthalmic disc. The first intradermal reading is observed 48 hours after injection. Seventy-two hours after injection, or the third day, the second reading is made. On this third day the usual number of preinjection temperatures is taken in connection with the

subcutaneous test. The subcutaneous tuberculin is now injected, using double the amount used for the initial test. Following the subcutaneous injection the same eye that received the 4 per cent ophthalmic solution or one ophthalmic disc is instilled with an 8 per cent ophthalmic solution or 2 ophthalmic discs. Subcutaneous test is resumed. The first post-injection temperature is taken at the third hour following the injection, the second at the sixth hour, and then continued at regular two-hour intervals up to and including the twentieth hour. Following each temperature measurement the eye is observed. The caudal fold is observed again at the ninety-sixth hour.

Previous to April, 1918, when testing under the officially accredited plan was begun, approximately 600 herds were under State supervision. The State plan contained practically the same requirements as the officially accredited plan. The principal difference was that under the State plan all tests were made by the local practitioners at the owners' expense. This State plan was discontinued July 1, 1919, except where the owner desired to continue the plan. About one-third, or 200 herd owners, who were working under State supervision have changed over to the officially accredited plan.

Another phase to tuberculosis eradication is the Bang method. It has been tried in Pennsylvania and found practical, especially in purebred herds. Unless the reacting animals are above the average in value and production, it is usually more economical for the owner to slaughter than to segregate with the idea of raising calves. Its practicability was first demonstrated at the Pennsylvania State Farm in Delaware County. A large number of owners have successfully kept one or more animals under this method. At present there are five Bang herds in Pennsylvania.

Pennsylvania had so many interests other than live stock, such as manufacturing, mining, etc., that the breeding and raising of cattle has been more or less neglected. In other words, we have been a buying and not a selling State. This has been detrimental to the tuberculosis eradication work in Pennsylvania. An average of 25,000 cattle for dairy and feeding purposes are imported each year. Last year (1919) seems to have been a banner year in this respect, for 35,547 cattle were imported for purposes other than slaughter. More purebred cattle were imported into Pennsylvania during 1919 than in any previous two years. More than 3,000 cattle are exported each year for dairy and breeding purposes. Imported cattle naturally originate in all kinds of herds. As a rule an

owner in disposing of excess cattle retains the best. Newly acquired cattle that have not been isolated and subjected to at least two successful tuberculin tests have been the means of infecting many healthy herds.

In comparing the results in Pennsylvania when the work of tuberculosis eradication was first started with conditions today, we can positively state that the disease has not only been held in check, but has been actually reduced. During the first five years of the board's existence (1896 to 1901, inclusive), an average of 17 per cent of cattle tested reacted, and 30 per cent of the reactors were tanked. The records for the last five years (1915 to 1919, inclusive), show an average of 9 per cent reacting of those tested, and but 15 per cent of the reactors tanked.

The most credit for the splendid results obtained in tuberculosis eradication, not only in Pennsylvania, but in the United States as well, belongs to Dr. Leonard Pearson, for in addition to bringing tuberculin first to this country and applying the first tuberculin test, it was he who planned the technique now used in applying the test. It was he who formulated our first State live-stock sanitary laws and regulations, designed the test charts, form of agreements, etc., which are, with but slight modification, in use today, not only in Pennsylvania but throughout the United States. It was he who did the pioneer work, blazed the way in tuberculosis eradication. His was no easy task. The thing was new and met with much opposition. He did not quit on that account, but stuck to it because he knew it was right and needed. In this work he had the assistance and valuable counsel of the two former Pennsylvania State Veterinarians, Doctors Gilliland and Marshall. This trio of peerless leaders in the profession, by reason of their capacity as scientists, intimate knowledge of the live-stock industry, administrative ability, foresightedness and tactfulness, and possessing the confidence of the people, made it possible for those who followed to accomplish the splendid results that we are now obtaining.

Due credit must also be given our practicing veterinarians. They, too, have done wonderfully valuable work in tuberculosis control. Without the assistance, coöperation and sympathy of the practicing veterinarians we could accomplish little. Our bureau has never been in sympathy with or favored any plan of tuberculosis control that would exclude our qualified and trustworthy practitioners. Our bureau welcomes the recent change made in the officially accredited plan which will permit our good practitioners to participate in the work.

Breeders and others interested in live stock have begun now, if never before, to realize that the control and eradication of tuberculosis is a pure and simple economic proposition. Live stock owners prove this themselves by so rapidly placing their herds under the officially accredited plan, regardless of the fact that the Federal and State bureaus do not have sufficient force to cope with the work. Furthermore, favorable mention is made of some phase of bovine tuberculosis control in practically every agricultural or live stock publication. The subject is given a place at nearly every agricultural meeting and farmers' institute. County agents and others, who in the past were reluctant to mention the subject, now advocate its control.

The accredited plan, proposed by Dr. O. E. Dyson, former State Veterinarian of Illinois, several years later (in 1917) approved with modifications by the United States Live Stock Sanitary Association, and afterwards adopted by the Federal Bureau of Animal Industry and practically all State regulatory officials, is undeniably the best and most uniform method yet offered for eradicating tuberculosis. Embodied in this plan are practically all the methods that have been proven beneficial in this disease. The live stock interests particularly benefit, as the best known technique is applied in detecting the disease. Infected premises are promptly disinfected. Added cattle are kept by themselves until they have passed two successful tests. Owners are advised regarding sanitation, including ventilation, light and drainage. They are also informed concerning the importance of paying close attention to the health and care of the calves. In other words, herds are freed in the shortest possible time, and after they become healthy every precaution is taken to keep them healthy.

The original accredited herd plan was amended in December, 1919. The changes in brief are as follows:

1. List of accredited herds published from time to time and those that have passed one successful test is to include a supplementary list. The supplementary list will include herds that have passed two annual tests with the exception of the herd bull. Such herds will not be issued an accredited herd certificate.

2. After a herd is accredited, and on a subsequent test not more than one reactor is found, the herd will be reinstated if all animals pass a successful test applied six months from date of the removal of the reacting animal.

3. Added cattle to an accredited herd, or to one in the process of accreditation, unless the added animals are from an accredited herd.

must pass two tests before they are permitted to be incorporated into the herds. The first or initial test must be done at points of origin. The added cattle are required to be tested by a regularly employed veterinarian of the Federal or State Bureau, or a veterinarian specially authorized by the Government and State to conduct such tests.

4. After a herd is accredited it may then be tuberculin tested annually by a specially authorized veterinarian. All tests conducted by these specially authorized veterinarians are made at the owner's expense.

5. Approved veterinarians are required to pass an examination conducted by the Federal Bureau and the proper officials of the State in which they reside.

From April, 1918, to January 1 of this year, 717 herds, comprising 11,730 cattle, were tested under the officially accredited plan in Pennsylvania, and 941, or 8.04 per cent, reacted. The work was carried out in 44 counties. Initial tests applied to 77 herds showed 70 per cent to be free. In other words, the disease was found in 30 per cent of those herds tested. Seventy-seven herds are fully accredited and have been issued certificates. We have on file close to 300 herds that have not been examined and tuberculin tested, but are on the waiting list.

In conclusion, the following are indispensably necessary to obtain a tuberculosis-free herd:

1. Veterinarians who are well qualified and interested in the work are trained in the breeding and care of cattle, also sanitation, and possess the confidence of live stock owners.

2. Owners who appreciate the economic importance of eradicating tuberculosis, are in sympathy with the work, desire to own healthy herds, and understand the requirements before beginning, will cooperate fully in respect to observing the precautions and measures and employing the means recommended by the bureaus to prevent reintroduction or development of tuberculosis in the herd.

3. A well-arranged and properly constructed and equipped barn, particular attention being given to ventilation, light and drainage.

4. If possible, breed and raise own stock. Provide proper feed and pure water.

5. Animals before being placed in the milking line should be provided with separate quarters and be permitted to have access to exercise yards. The control of bovine tuberculosis is mainly a matter of prevention of infection of new-born calves.

CLINICAL AND CASE REPORTS

MY EXPERIENCE WITH FORAGE POISONING¹

By O. B. MORGAN, *Rocky Ford, Colo.*

While this paper is entitled "My Experience with Forage Poisoning," I am wondering whether or not it would be well to speak of the disease as the "Kansas horse disease." This name seems to carry with it a more definite idea of the exact nature and extent of the disease. Those who observed the "Kansas horse disease" in Kansas in 1912 and this disease say they are the same thing. Perhaps neither one of these names is what it should be called, but they will do for the present so we will have an idea of the disease we are going to talk about.

HISTORY OF CASES

On July 17, 1919, I was called to see a mare over 15 years old suckling a colt. In conversation over the telephone the owner said he thought this animal had some form of digestive trouble. On arrival at the ranch I found the animal lying down flat on one side and would occasionally raise the head and point toward the side. With very little effort we got the animal up and she staggered up against the barn and stood there. After moving her away from the barn she wanted to turn in a circle. Her temperature was 105, pulse normal but very strong, conjunctival mucous membrane highly congested and the membrana nictitans showing ecchymotic hemorrhages. The abdomen was very much tucked up, a furrow extending backward from the costal arch presenting a very gaunt appearance, with peristalsis absent. On examination of the mouth I found a very offensive odor and pharyngeal paralysis.

I was informed by the owner that the animal came up with the rest of the animals from the pasture the previous evening and was noticed to be gaunt and a little stupid. The following day this animal was kept in the corral and was noticed lying down most of the time and would get up without assistance. After gaining her feet she would go in a circle, but was not very nervous. The lowels had moved a few times during the first 24 hours of her illness, at first loose, later more firm. I began to question the owner as to the foods, and he informed me that the animals were on pasture and it was as good as any pasture in that vicinity. At this

¹ Paper presented at the annual meeting of the Colorado Veterinary Medical Association, Rocky Ford, Colo., February, 1920.

time I was of the opinion that I was dealing with a sporadic case of forage poisoning.

On July 22, 1919, I was called to an animal one and one-half miles from the first case that was showing practically the same symptoms. This animal was being worked regularly, getting good, clean hay and water from a well. On July 24, 1919, I was called to another case showing practically the same symptoms. I did not have any more of these cases until August 1, then I began to receive a number of calls of the same nature within a 3-mile radius of the first case. This disease was rapidly appearing in this vicinity, gradually spreading west and north. It has made its appearance in almost all localities of the Arkansas Valley and extending to the northern part of the State.

At this time I began to realize that I was dealing with an enzoötic and made a closer search for the offending material. I found all the foods fairly clean; at least they looked so, but the water in some places was not very good. These cases were developing close to a reservoir, some in swampy places where the water was low and lots of salt grass, and some where they were being kept up and fed hay and getting good water. Later cases were observed on the dry land where nothing was growing except buffalo grass and getting water from a deep well.

It would be hard to imagine how a mold could develop on such a high and dry pasture as that and produce disease as has formerly been thought. At first it seemed as though the stagnant water and pasture might be a source, and owners were advised to keep their animals up and give them good water and hay. We found that cases developed about the same. Next they were advised to feed first-cutting hay and if possible last year's hay or prairie hay that was shipped in, but not any green feed. In other vicinities everybody kept their animals in corrals, for they did not have any pastures. A few when advised fed first-cutting hay. In both places cases developed after 21 days of feeding first-cutting hay and no green feed. I failed to find anyone who had last year's native hay to feed, and I know of only 3 cases where prairie hay was fed. In the first case a part of a bale of alfalfa was fed by the help, contrary to the owner's wishes, and about 14 days later one of the animals developed the disease. In the second case the animal had about 15 minutes' grazing, and some 12 days later it developed the disease. In the third case first-cutting alfalfa was fed about 2 weeks after the disease started, then they fed prairie hay and corn that was

shipped in and bran and oats that were home-grown. These 4 animals remained well. It would seem that in the first case feeding alfalfa apparently carried the infectious material and in the second case the grass was the probable carrier; however, sufficient evidence is not at hand to enable one to determine the various sources of the infection. It seems as though cases developed under all conditions with the exception of the feeding of prairie hay which was shipped in.

A number of colts developed the disease, the ages ranging from 15 days to 5 months. If the different foods are carriers of the infectious material, which seems to be the case, it would seem that it would take a very small quantity to produce the disease. In the case of two young colts (15 and 21 days old), a few straws at the best would be about all the food they would get outside of their mother's milk. In no case to my knowledge did the sucking colt of the affected mother develop the disease, and the mothers of affected colts remained well with the exception of one, in which case the mother developed the disease a few days after the colt did.

A well animal was injected intravenously with 30 mils of blood from an affected animal and failed to develop the disease. Of course this one test does not prove that it can not be transmitted in that way, but it would seem that it was not easily transmitted from one animal to another. The heavier type and the fattest animals seem to have the disease in a more severe form, particularly those that were worked at the time of illness. I think the reason is that in the majority of cases the animals were worked a part of the day while they were sick. The horses in pastures seemed to have had the disease in a milder form, or they were better able to withstand it. The majority of animals in the pasture being young and not unduly exerted while sick probably explains why they had it in a milder form.

I saw 10 young colts affected with the disease, and all recovered except one, which was drenched before I saw it and probably died as a result of drenching. I also saw animals 21 years old, one jack and a few mules affected.

SYMPTOMS

While I gave the symptoms in the first case, they were by no means complete of this disease; so I will describe them in a general way. In some cases profuse sweating was noticed 12 to 24 hours previous to the attack, and in some cases gaping was one of the

first signs, while in others there would be lameness. If the animal was being worked the owner would notice it to be very stupid, and in a number of cases the animals were forced to work the rest of the day, as the owners thought they were laying off on them. In some cases there would be frequent bowel movements before other symptoms would develop. On examination one would find the temperature from 100 to 106, or even subnormal, the pulse usually around normal in rate but very strong, later fast and weak; peristalsis very weak or maybe absent; the abdomen very much tucked up, presenting a very gaunt appearance; the feces soft, mixed with mucus and tinged with blood at first, later becoming more firm and coated with mucus; the tongue hanging out the side of the mouth or between the teeth; in a few cases there was grinding of the teeth; very offensive odor from the mouth, and pharyngeal paralysis in the majority of cases. There would be a serous discharge from the eyes and nose, to be followed by a mucous discharge. On examination of the eye, the conjunctiva would be congested and red, and in some cases icteric; the membrana nictitans would show ecchymotic hemorrhages; the eye was sometimes unable to close, the ear drooped, the upper lip drawn to one side and the lower lip dropped. The same expression is seen here as in those cases where the seventh nerve is paralyzed, as in facial paralysis; this may be unilateral or bilateral. Blindness is not very common. The animals may stand with eyes half closed and go to sleep on their feet, or they may show excitement, running into objects, getting into a corner and pushing; some cases walking stiff-legged as if they were not able to maintain their equilibrium.

The course of the disease depends on the severity of the symptoms; in some cases the disease runs a rapid course and terminates fatally in from 12 to 24 hours, while other cases develop more slowly and terminate either fatally or recover in from 24 hours to 10 days. Some cases fall over dead after they have apparently recovered, and a few cases were somewhat deranged mentally for some weeks, while a very small per cent are permanently deranged. A large majority of those that do recover are practically as good as ever.

TREATMENT

The treatment of this condition will depend largely on the symptoms present. While veterinarians may differ somewhat in their method of treating this condition, the end results are about the same, from what I can find out by consulting them.

Treating the symptoms seems to be the logical way to deal with this disease. The stomach tube should always be used to medicate these cases and give them the necessary water. Drenching is a dangerous procedure in nearly all cases. All kinds of cure-alls have been used; among them are pouring chloroform in the ear to kill the larvæ of a tick that is supposed to burrow into the brain and cause the trouble; cutting off the tail, rubbing the spine with St. Jacob's oil, and smoking with old shoes and tar, so they run at the nose. We had a good many "village hoss doctors," some that were in the Kansas outbreak and never lost a case.

Purgatives are always in order, both the rapid and the slow-acting ones; of the slow-acting purgatives, aloes or aloin, preferably Barbados aloes, where they can be given in capsules, as they are not very soluble in water. Aloes were given in 1 to 2 ounce doses and aloin in from one-half to 1 ounce doses, with 2 to 4 pounds of magnesium sulphate, and water from 3 to 10 gallons. In no case did superpurgation follow. After purgation was established only a very few cases failed to recover. Mineral oils were used without apparent benefit. I have used castor oil with fair results, but it does not seem to act as rapidly as aloes and magnesium sulphate. It was discontinued in the mature animals, but was used altogether in colts in from 4 to 6 ounce doses and the results were very good. Barium chloride was also used in some cases with good results.

In those cases that were unable to drink, large quantities of water were given, to which was usually added salt in sufficient quantity to make approximately a normal salt solution. This was given every 24 to 48 hours and continued for as long as 10 days. The water not only supplies the body with the necessary fluids, but assists the purgatives.

Of the hypodermic cathartics, arecolin seems to give the best results, as it not only moves the bowels, but lowers blood pressure, and rapid improvement frequently follows its administration. The drug is used in one-half to 1 grain doses. Great care should be used in its administration, as a heavy animal and a few that are not heavy rarely survive its administration.

Thinking that the infection originated in the intestinal tract, various intestinal antiseptics were used, and I believe there was some benefit derived from their use.

The nervous symptoms were controlled with fluid extract of gelsemium in 1 dram to 1 ounce doses at hourly intervals until the desired results were obtained. I have seen more marvelous results

from the use of this drug in cases of cerebral excitement and also good results where some coma was present. I have used it on cases that were raving maniacs and had them perfectly quiet in 3 to 5 hours later, eating and drinking in 10 hours. Potassium iodide was used on those cases that were slow to recover, with beneficial results.

With the foregoing treatment my recoveries were 61.2 per cent.

GARDEN PARTY IN HONOR OF DEAN AND MRS. HOSKINS

A most delightful garden party in honor of Dean and Mrs. W. Horace Hoskins of New York University, given by Professor and Mrs. William Herbert Lowe on the spacious grounds surrounding their residence, Trenton avenue, Paterson, N. J., Saturday afternoon, July 17, proved a great success. Many guests from New York City and Northern New Jersey were present, including the following: Major E. B. Ackerman, Dr. W. J. McKinney, Miss A. McKinney, Dr. and Mrs. A. H. McIntosh, Mrs. Cline, Dr. and Mrs. Geo. W. Little, Dr. and Mrs. E. T. Davison, Professor and Mrs. Wilfred O. Lellman, Mrs. Roscoe R. Bell, Miss Virginia Bell, Dr. and Mrs. A. F. Martins, Dr. and Mrs. Thos. H. Ripley, Dr. and Mrs. E. J. Decker, Miss Dorothy Decker, Dr. and Mrs. J. Payne Lowe, Miss Helen Lowe, Mr. Jack Lowe, Mr. Edward Whitmore, Mr. Howard Bristow, Mr. Robert Boyle, Miss Harriet Lowe Coombs, Miss Alice Coombs, Miss Melissa Hurd, Dr. Edward A. Schmalz, Miss Lamb, Dr. and Mrs. C. W. Shaw, Dr. Geo. H. Berns, Miss Nellie Berns, Dr. and Mrs. J. W. Haffer, Dr. and Mrs. R. W. Butterworth, Miss Jennie Young, Prof. Henry Henning, Dr. and Mrs. J. B. Finch, Prof. and Mrs. William Herbert Lowe, Dean and Mrs. W. Horace Hoskins, Dr. and Mrs. Nicholas Kaiser, Mayor and Mrs. J. B. Hopper, Dr. and Mrs. T. E. Smith.

Veterinary progress in the newly created nations of central Europe is indicated by the founding of two new veterinary schools, one at Zagreb (Agram) for the Jugo-Slavs, and the other at Brünn for the Czecho-Slavs.

Dr. J. F. A. Bessemans, Sanitary Inspector of the Belgian Government, has been visiting the various laboratories in New York, Philadelphia, and Washington, with the view of informing himself regarding the work that is being done in this country to prevent the transmission of animal diseases to man.

ABSTRACTS

A POSSIBLE FAILURE OF TUBERCULIN IN COWS IN GESTATION OR WHICH HAVE JUST CALVED. R. Bissauge. *Rev. Gén. Méd. Vét.*, Vol. 28 (1919), No. 336, p. 679.

From 1915 to 1918 Bissauge had occasion to verify the sensitiveness of cows in pregnancy, or that had recently calved, to the intradermic palpebral tuberculin test, in 3 herds of 16 to 20 cows each, which were sold for slaughter. These herds were known to have been badly infected with tuberculosis for several years. The test revealed a large number of affected animals, but the clearly positive reactions were less numerous than had been expected. Of 12 pregnant cows found on autopsy to be slightly affected with tuberculosis, 4 had not reacted and 2 had given only doubtful reactions. Of 6 cows that had calved within 8 days, 2 that were found on autopsy to be tuberculous had not given clear reactions, while in 4 tuberculous cows that had calved 12 to 15 days previously the reaction had been typical.

The author formulates the following conclusions: (1) In the last two months of gestation, and especially in the last month, the reaction to tuberculin may fail or may manifest itself only very lightly in tuberculous cows, even without fever. (2) The same may also occur in cows that have recently calved, up to the tenth day after calving. He also concludes that it is prudent not to submit to the tuberculin test, even by the intradermic method, pregnant cows unless they are less than seven months in pregnancy, nor cows which have recently calved, until after 10 or 12 days.

In this connection he cites the work of Bar and Devraigne (*Journal d'Obstétrique*, April, 1919) on pregnant women. They found that pregnant women are less sensitive than others to tuberculin, and that the diminution of sensitiveness is especially pronounced during the last month of gestation and very marked during the days following delivery. To this extent they confirmed the earlier work of Stern. But Stern had reasoned that, since the positive reaction indicates the presence of antibodies, in pregnant women the antibodies diminish or even disappear; and having injected lecithin for ten days and observed no reaction he concluded that the lipoids, in excess during pregnancy, attract the antibodies and fix them, after which there is no reaction to tuberculin. Bar and Devraigne, however, in attempting the experimental verification of the influence of pregnancy on the antibodies, obtained negative results.

INTESTINAL COCCIDIOSIS OF SHEEP IN MOROCCO. Assistant Veterinarian Major Bouin. Rec. Méd. Vét., Vol. 95, No. 21 (1919), p. 617.

Intestinal coccidiosis of sheep is a well known disease always existing in Morocco, but not reported. It has been well studied and described by Moussu and Marotel.

In Morocco, Velu has mentioned an epizootic coccidiosis discovered in a flock of goats. Besides, he reported the existence of *Eimeria zurni* in cattle apparently in a good state of health.

The author had the opportunity of following an epizootic of intestinal coccidiosis ravaging a flock of sheep. The first autopsies did not permit of a diagnosis; there were no internal or characteristic lesions, and very few parasites.

In the presence of so small lesions intestinal coccidiosis suggested itself and the microscopical examination confirmed the opinion.

The symptoms observed were those of progressive anemia, but at a relatively rapid rate, contrary to what has been reported by Moussu and Marotel. In a general way the duration of the disease was from 8 to 10 days.

The first symptoms observed by the shepherd are dullness and indolence. The patient painfully follows the flock, then remains behind, and lies down. The appetite is decreased, but not absent.

Diarrhea appears, almost solid at first, but later more liquid. The animal emaciates and the mucous membranes become pale. The patient generally succumbs without displaying other symptoms.

It is interesting to note that the epizootic which is described involved a flock which was well taken care of and well fed, pasturing on a field which was frequently irrigated.

This flock, which comprised 500 head, consisted chiefly of yearlings. All the animals which died were of that age. Nearly all the animals which remained with the flock died. On the contrary, those removed at the beginning of the affection were cured spontaneously without any particular treatment.

The epizootic commenced at the end of April. During the months of May and June 50 animals died, that is, 10 per cent of the whole.

The lesions encountered at each autopsy were the lesions of hemorrhagic enteritis, most of the time showing only in the large intestine.

Besides, on the surface of the whole intestine was generally found more or less numerous small white points, smaller than the head

of a pin, which were the glands of Lieberkuhn hypertrophied and containing an abundance of coccidia.

The casual agent was the *Coccidium faurei* studied and described by Moussu and Marotel. It is easily found by microscopical examination of the excrements of the patients, but more easily and more distinctly by examining the scrapings of the intestinal mucus around the small white spots mentioned above.

It was only with difficulty and after long researches, that the *Coccidium faurei* was found in the excrements of the old members of the flock, which were in a good state of health. The danger to which the flock is exposed through these apparently healthy animals which, however, are carrying parasites, is evident.

The conditions under which this epizootic appeared prevented any medicinal treatment. The bedding places where the animals were placed every night were changed frequently. After each change the mortality ceased for a few days, but the disease reappeared later. From this the author concludes that better results might have followed if the sheep had been moved to a greater distance and to new pastures.

JOINT ILL IN FOALS. Abstract from *The Lancet*, London, Vol. 193, No. 5036 (1920), p. 563.

Among other interesting matters the *Journal of Comparative Pathology and Therapeutics* for December, 1919, contains an account of experiments conducted at the Research Institute in Animal Pathology, Royal Veterinary College, London, into the cause and serum treatment of joint ill in foals. The investigations were conducted by Sir John McFadyean and Captain J. T. Edwards. The chief organisms found in bacterial and cultural examination of the diseased joints were streptococci, coliform bacilli, *Bacillus nephritidis* (Meyer), an interesting case of streptothrix, and three cases where the organisms were not of any named species. Seventy-two cases were examined during two years of research. The conclusion come to by the investigators is that vaccines and serums are not of any value in the treatment of pregnant mares which are likely to produce affected foals, nor are they preventive or curative of joint ill when applied to the foal itself. Two hundred and fifty-three cases were treated with the antistreptococcus serum and the authors base their conclusions on these results. Joint ill causes the death in early years of much valuable equine stock, and these investigations should lead to further understanding and research with regard to the

disease. At present clean and hygienic stables, proper feeding of the dam, and careful attention to the umbilical cord of the foal at birth seem to be the best preventives. It is somewhat significant that common bred stock kept largely out of doors, or in stables with few animals in, suffer the least from outbreaks of joint ill.

COMMUNICATION

FOOT AND MOUTH DISEASE IN FRANCE

The following letter from Grandpré, in the Argonne region of France, is self-explanatory:

"The farmers here having lost all their cattle owing to the war—this country was four years in German hands—are now losing their fresh stocks of cattle owing to foot and mouth disease. There seems to be two sorts, one which takes the ordinary course, in which the animals are ill for some time, and die or recover, and another where death takes place in a few hours. I have just been told by a visitor from Philadelphia that in the States you have controlled this disease, and that if I applied to you, you would be so kind as to give me the necessary information. If so, I should be very much obliged, as living here in continual contact with the farmers, I cannot fail to be much distressed by what is a very serious loss to them. They are working most pluckily, under very hard conditions, to overcome the consequences of the war, and this bad setback means discouragement as well as great pecuniary loss."

WOMAN NURSE IN CHARGE OF DOG HOSPITAL

Dayton, Ohio, now has a full-fledged dog and cat hospital.

And it also has a dog grocery.

The combination has been established by Dr. H. T. Moss, veterinarian, at 710 West Third Street. It is the only institution of the kind in that section of the country.

The hospital is for pets of all kinds, chiefly dogs and cats. The hospital is divided into stalls or "wards." A woman nurse is in charge to minister to the needs of the animals. The kennels are large and sanitary, convenient to the individual treatment of animals. The grocery is in front and the stock consists of everything required by the dog from biscuits to muzzles. The building is a new two-story pressed brick, recently completed.

ARMY VETERINARY SERVICE

ARMY VETERINARY SCHOOL

The War Department recently announced in Circular No. 271, dated July 16, 1920, the establishment of the above mentioned school for the Army Veterinary Corps. This is the first school to be authorized for the Veterinary Corps and it shows that a definite program of instruction for veterinary officers and enlisted men is to be developed.

A school designated as the Veterinary School of Meat and Dairy Hygiene will be maintained at the General Supply Depot, Chicago, Illinois. The object of this school is to instruct veterinary officers and selected enlisted men of the Medical Department assigned to the Veterinary Corps in duties pertaining to the inspection of meats and meat food products, dairies and dairy products and forage in connection with the purchase, storage, shipment and issue of these supplies, and to the sanitation of establishments, storehouses, vehicles or other places in which they are prepared, stored, shipped, issued or otherwise handled.

A course of instruction at this school is expected to form a part of the military training of every veterinary officer or candidate for commission in the Veterinary Corps and of the necessary Reserve Officers. It will, therefore, constitute an integral factor of the system of Medical Department training under the general direction of the Surgeon General.

As one of the activities at the General Supply Depot, the Depot Officer will be commandant of the school. Instruction at the school will be under the immediate charge of the veterinarian of the Depot assisted by not to exceed three veterinary officers as instructors and four enlisted men as assistant instructors who will be designated by the Surgeon General for these duties. While this personnel is primarily for instruction purposes, its services may be utilized for inspection duties at the Depot when such duty will not interfere with the course of instruction.

Instruction will be given in two classes each year beginning July 15 and January 15 and lasting about 5 months. Each class will consist of not to exceed 15 officers and 20 enlisted men. Each officer and enlisted man who satisfactorily completes the course will be given a certificate of proficiency signed by the commandant and by the veterinarian in charge.

Instruction schedules will be prescribed by the Surgeon General after conferring with the Quartermaster General with reference to such phases of the inspection work as are directly concerned with specification requirements. It is intended that graduates of the school shall be fully qualified not only in all sanitary inspection requirements but also in the application and interpretation of purchasing specifications.

Instruction will be by means of lectures and demonstrations followed by practical application of inspection measures in the stock yards, packing houses and other available establishments. Successful training demands from the student the utmost degree of personal contact with the actual inspection procedures at all times under the supervision of an instructor. Quizzes and periodical examinations will be required in all subjects and each student will undergo a final examination.

Major George A. Lytle, V.C., is the veterinarian in charge. Captain H. S. Eakins, V.C.; 1st Lieut. H. P. Welch, V.C.; and 1st Lieut. H. J. Juzek, V.C., have been detailed as instructors.

The following veterinary officers compose the first class ordered for instruction:

Colonel W. G. Turner, Lieut. Col. J. R. Jefferis, Majors H. W. Peter, J. A. McKinnon, W. R. Pick; Captains R. C. Musser, W. J. Stokes, D. B. Leininger; 1st Lieuts. A. C. Wight, E. L. Nye, H. Clarke, E. M. Curley.

NO WHISKEY FOR ANIMALS

A member of the American Veterinary Medical Association requested me to find out if veterinarians could prescribe alcoholic liquors for their animal patients.

This matter was taken up with the Bureau of Internal Revenue and the following reply was received:

"Replying to your communication of June 16, 1920, you are informed that veterinarians may not prescribe intoxicating liquors for internal use for their animal patients. Under the statute the right to prescribe intoxicating liquors for internal use for medicinal purposes is limited to duly qualified physicians for persons only. Not to exceed 6 quarts of alcohol may therefore be obtained by any veterinarian during any calendar year to be obtained and used as provided by Regulation 60."

N. S. MAYO, *Secretary.*

ASSOCIATION MEETINGS

NEW YORK STATE VETERINARY MEDICAL SOCIETY

The thirtieth annual meeting of the New York State Veterinary Medical Society was called to order by the President, Dr. H. S. Beebe, July 21, in the large lecture room of James Law Hall at the New York State Veterinary College at Cornell University. Acting President A. W. Smith gave an address of welcome on the part of Cornell University. Hon. E. C. Stewart, Mayor of the City of Ithaca, gave a welcome for the city of Ithaca. Mayor Stewart was a member of the upper chamber of the New York State Legislature when it passed the bill establishing a Veterinary College at Cornell University. He was able to influence the passage of that bill to a very considerable extent. He was thus well qualified to review the history of the legislation in behalf of veterinary medicine in the State. Mayor Stewart did this to the very great interest of all his hearers. After such a warm welcome as extended by President Smith of Cornell University and the Mayor, the members and visitors felt entirely at home so far as Ithaca and Cornell University were concerned. Dr. E. L. Volgenau of Buffalo was scheduled to respond to the previous speakers. Business interfered with his being present. Dr. W. Reid Blair kindly consented to take his place and proved to be a very happy choice. In agreement with the requirement of the constitution and by-laws of the society, President Beebe gave an interesting and helpful address touching upon the condition of veterinary medicine in New York State. The usual order of business was then taken up. The reports of the various committees were unusually interesting and complete. The Board of Censors nominated fifteen new members. All of the men put in nomination were acceptable and were duly elected.

The first paper of the first day was "The Cultivation of Bact. Tuberculosis Direct from Sputum and Infected Tissue," by Dr. Giovanni Martinaglia. Dr. Martinaglia, a native of South Africa, and a graduate of Toronto, worked during the past year in the laboratory of Dr. V. A. Moore. From his work he was able to present a most interesting paper and many actual cultures with which to illustrate it. Dr. V. A. Moore and Dr. W. A. Hagan discussed the paper and added much to its value. During the afternoon session Dr. W. A. Hagan read a short paper on "Fat Necrosis in Cattle." It was emphasized by Dr. Hagan and Dr. F. W. Andrews, who

discussed the paper, that the condition was frequently taken for tuberculosis in field work. Dr. W. W. Williams of Springfield, Mass., read an interesting and instructive paper on "The Diseases of the Bull Interfering with Reproduction." This paper was illustrated by lantern slides and microscopic demonstrations. The illustrations and microscopic demonstrations in the main were of spermatozoa in both physiological and pathological condition. The main discussion was by Dr. C. M. Carpenter. Dr. H. L. Gilman followed Dr. Williams with a paper on an allied subject, "Diseases of the Oviduct of the Cow and Their Relation to Sterility." The authors of the last two papers are among the pioneers in the respective subjects. The work of Dr. Gilman, as did that of Dr. Williams, brought forth favorable discussion and comment. Dr. Gilman illustrated his work with excellent lantern slides. Dr. L. J. Tompkins chose as his subject "The Care of the Milking Machine." Dr. Tompkins is in his own field in discussing problems relating to milk production. Dr. C. I. Corbin and Dr. J. McCartney, likewise experts in the production of clean milk, discussed the paper.

It is rather unusual for this society to continue the program into an evening session. It is more unusual for such a meeting to hold the undivided interest of members and visitors until near the midnight hour. That the speakers were able to continue the program until such a late hour is a tribute. The dinner was served in Baker Tower and on the campus of Cornell University. At its conclusion President Beebe called on Dr. W. G. Hollingworth, who read a paper entitled "Be Kind to Animals." Dr. Hollingworth developed the subject in such an interesting manner that the local press borrowed the paper for the next day's issue. Dr. Hollingworth had able support in the discussions of Dr. V. A. Moore and Dr. P. A. Fish, each of whom had interesting and instructive points to make. Dr. Beebe next called on Dr. H. D. Bergman of Ames, Iowa, who arrived during the day's session. Dr. Bergman gave a short talk, comparing the difference in subjects which interest the practitioner of New York and Iowa as revealed by the programs of the two State societies. Dr. Bergman was welcomed in all the meetings and we were glad to have had him with us. Dr. V. A. Moore next talked on "Anaphylaxis and the Tuberculin Reaction." Dr. Moore illustrated his talk with charts and frequent reference to the valuable literature on the subject. He discussed rather fully the tuberculin reaction, its relation to anaphylaxis and the relation of both to the non-reactor. This talk was a masterly discussion of the problem.

of those administering the tuberculin test and handling tuberculous animals. Dr. J. G. Wills, Dr. H. B. Leonard and Dr. Cassius Way sustained the interest in the talk by their able discussions.

Dr. C. R. Baldwin read the first paper of the second day's session on "Mange in Cattle." His paper brought forth a considerable number of good discussions. The next paper by Dr. Chas. S. Chase on "Mammitis," met with a good reception and brought forth extensive discussion, led by Dr. J. N. Frost. Dr. W. Reid Blair had chosen as a subject for a paper "Animal Intelligence." Dr. Blair, in his connection with the New York Zoölogical Gardens, has had a lot of experience leading up to his subject. His paper was one of the most interesting given during the meeting. It was illustrated by a large number of lantern slides in color. These slides told a very complete story in themselves. The paper was of general as well as practical interest and we could have had an audience of 2,000 people for it just as well as 200 had we appreciated its scope. Dr. R. A. MacKellar and Dr. W. G. Hollingworth added interesting discussions.

The papers on the afternoon program were well up to those coming before. Dr. H. J. Milks and Dr. S. A. Goldberg had prepared a paper on "Infectious Enteritis in Cats." Dr. Milks read it and Dr. Goldberg discussed it. Dr. F. F. Koenig's paper on "Diseases of the Foot of the Cow and Treatment" was appreciated and was discussed by Dr. W. B. Switzer and Dr. A. H. Ide. Dr. W. E. Frink had an excellent paper on "Hog Cholera Control." Dr. W. L. Clark, Dr. R. R. Birch and Dr. W. H. Salisbury discussed it. Dr. J. M. Staley of the H. K. Mulford Co. read the last paper. The subject was "Bovine Abortion Bacterial Vaccines." Dr. L. A. Norget was to have presented some unusual and interesting case reports. Illness detained him at home and so his paper was not presented.

The completion of the order of business resulted in the election of Dr. Wright J. Smith as president, Dr. D. H. Udall as vice-president, Dr. C. E. Hayden as secretary-treasurer, and Dr. H. J. Milks as librarian. Dr. D. B. Comstock, Dr. W. E. Frink, Dr. W. H. Phyfe, Dr. W. Reid Blair and Dr. W. L. Clark were elected to constitute the Board of Censors. Buffalo was designated as the place of the next meeting.

Clinics and postmortems were held during Friday morning in the operating and postmortem rooms of the college.

The wives, daughters and sons of the members who visited were

present at the opening exercises. At noon they had luncheon at the Wistaria Tea Garden. At 4 p.m. they were given an organ recital in Bailey Hall by Prof. J. T. Quarles. In the evening they attended the dinner session. On Thursday they enjoyed a visit to Watkins Glen. In the evening Dr. and Mrs. V. A. Moore held an informal reception at their residence at 914 East State street. About 200 members and visitors had opportunity to meet each other and enjoy the hospitality extended by Dr. and Mrs. Moore.

C. E. HAYDEN, *Secretary*.

CENTRAL NEW YORK VETERINARY MEDICAL ASSOCIATION

The eleventh annual meeting of the C. N. Y. V. M. A. was held at Syracuse, June 30, 1920.

The session was opened with a clinic at the Infirmary of Dr. J. A. Pendergast, which took from 9.30 a. m. until 3 p. m., lunch being served at the clinic.

The cases operated on were as follows: Black mare, myotomy of tail, Dr. Dooling's case. Surgeons: Drs. Ide, Pendergast and Dooling.

Brown mare, elongated tooth, Dr. Stack's case. Surgeons: Drs. Stack and Long.

Mule, extracting molar, Dr. Pendergast's case. Surgeons: Drs. Pendergast and Ide.

Black gelding, ulcerated corn, Dr. Pendergast's case. Surgeons: Drs. Pendergast and Dooling.

Gray mare, quittor, Dr. Dooling's case. Surgeons: Drs. Bosshart and Boardman.

Roan gelding, roarer, Dr. Pendergast's case. Surgeons: Drs. McAuliff and Boardman.

This closed a very interesting and successful clinic, and an adjournment was taken to meet at the St. Cloud Hotel.

The business meeting was called to order at 3.30 p. m., at the Hotel St. Cloud, with President W. L. Clark in the chair. At the call of the President the Secretary read the minutes of our last regular meeting, which were approved.

Roll call by the Secretary showed the following members present: Drs. F. E. York, J. A. Pendergast, J. M. Currie, E. E. Cole, A. J. Tuxill, E. E. Dooling, W. L. Clark, A. E. Merry, C. R. Baldwin, W. M. Pendergast, Almond H. Ide, J. H. Hewitt, J. K. Bosshart, M. W. Sullivan, R. C. Hartman, F. C. Overton, J. H. Stack, W. M.

Long, D. A. Boardman, George A. Shaw, Dr. Otto Faust, and W. B. Switzer.

The following applications for membership were presented: Dr. F. E. Hoyt, Dr. D. M. Hoyt, Dr. J. L. McAuliff, and Dr. J. B. Knapp.

There was a motion made and carried that the Secretary cast one ballot for the above mentioned gentlemen and upon such ballot being cast they were declared elected to full membership.

Motion made and carried that the Secretary be instructed to see that all members who have not received their membership certificate get them at our next regular meeting.

At this time the President delivered his address, which was both interesting and instructive, and was duly accepted.

The Secretary gave a brief verbal report of the work of the year, calling particular attention to the number of new members taken in.

The Treasurer's report was then read and showed the Society to be in a flourishing condition. This report was referred to the Auditing Committee, which reported favorably and it was accepted.

Dr. F. M. Burke was reported as being in the Crouse Irving Hospital for an operation, and the Secretary was instructed to write Dr. Burke in behalf of the Society, assuring him of our sympathy and best wishes for his speedy recovery.

The meeting now proceeded to the election of officers, and on calling for nominations for President, Dr. A. J. Tuxill's name was presented. There being no other nomination the Secretary was instructed to cast the unanimous ballot in favor of Dr. Tuxill.

President Clark at this time seated the new President and turned the meeting over to him.

President Tuxill then called for nominations for Vice-President. At this point Dr. E. E. Dooling arose and after making some very complimentary remarks, presented the name of Dr. J. K. Bosshart for Vice-President. There being no other nominations the Secretary was instructed to cast the unanimous ballot of the Society for Dr. Bosshart.

Ex-President Clark was then instructed to cast one ballot for the reelection of the Secretary-Treasurer.

In electing a Board of Censors, it was suggested that the name of Dr. H. A. Turner be removed from the list as it now stands and Dr. C. R. Baldwin be substituted. It was so ordered.

Censors are Dr. E. E. Dooling, Dr. J. C. Stevens, Dr. A. H. Ide, Dr. J. H. Stack, Dr. W. G. Hollingworth, Dr. C. R. Baldwin.

The following papers were then presented: Difficult Parturition Relieved by Embriotomy, by Dr. W. M. Pendergast. Mastitis and Pericarditis, by Dr. D. A. Boardman. A case of partial torsion of the neck of uterus, by Dr. W. M. Sullivan.

These subjects were all well discussed and proved very interesting and instructive.

Dr. Dooling moved that one year's dues be refunded Dr. Hewett. This motion was carried and the Secretary ordered to draw a check for the amount in favor of Dr. Hewett.

Dr. Hewett accepted the check under protest, and immediately presented it to the Society, after which he was given a rising vote of thanks.

It was moved and carried that the four new members furnish papers for the next meeting, to which they agreed. Dr. Currie, Dr. Hewitt, and Dr. E. E. Cole also volunteered papers.

At this point we adjourned to meet the ladies and proceeded to the banquet table.

President Tuxill appointed Dr. E. E. Dooling as toastmaster, and after every one had eaten until there was no further incentive for this pleasant diversion, the toastmaster introduced the Hon. J. R. Clancy as the principal speaker of the evening.

His subject was "The Relation of the Veterinarian to the Stock Owner." It was very instructive, and contained some reminiscences of the late Dr. Matt Henderson, which were well received.

The toastmaster then called on Drs. Faust, Currie, Pendergast, Clark and others, all of whom added some happy thought to what we had already received.

Adjournment was taken at this time with a feeling that this was one of our very best meetings, and we shall look forward to the coming semi-annual meeting in November.

W. B. SWITZER, *Secretary*.

VETERINARY MEDICAL ASSOCIATION OF NEW JERSEY

The Veterinary Medical Association of New Jersey held its thirty-sixth semi-annual meeting at Asbury Park, N. J., on July 8 and 9. This meeting had a large attendance and proved to be most successful.

On the first day many papers were submitted which allowed very interesting discussions and on the day following a clinic was held at

Dr. V. B. Height's Veterinary Hospital, where the members had the opportunity of witnessing several operations.

Among the papers read was one prepared by Dr. Arthur D. Coldhaft, of Vineland, N. J., who took as his topic "Tapeworms in Chickens."

The following resolution upon the death of Dr. James McCaffrey, of Red Bank, N. J., was spread upon the minutes:

Whereas, the death of our respected and esteemed colleague, Dr. James McCaffrey, of Red Bank, N. J., a graduate of the American Veterinary College, New York City, class 1885, fills our hearts with sadness; and

Whereas, in his demise the State loses an estimable citizen and the profession of New Jersey one of its most successful practitioners: Therefore be it

Resolved, That a page be set apart in our minute book to his memory and that we express our sympathy to his family in their bereavement; and be it further

Resolved, That a copy of these resolutions be furnished the veterinary periodicals for publication, and also that a copy be sent his family.

R. W. BUTTERWORTH, *Secretary*.

NORTHWESTERN PENNSYLVANIA VETERINARY CLUB

In December, 1919, a number of representative veterinarians from the northwestern section of Pennsylvania met at Corry and formed the Northwestern Pennsylvania Veterinary Club, the sixth club of its kind in Pennsylvania.

A second meeting of this Club was held at Corry in March, 1920, a third at Titusville, May 3rd, and a fourth with twenty-one veterinarians present was held July 12th at Conneaut Lake. This was the banner meeting of the Club and can be attributed to the united efforts of all members.

Dr. Leon A. Eckart, President, Dr. W. W. Pease, Secretary, and Dr. M. P. Hendrick had arranged for the following interesting program:

Address of Welcome by Mr. S. A. Cooper, President of Conneaut Lake Chamber of Commerce.

Ridgling Castration.—Dr. W. W. Wilson.

Demonstration of Double Treatment for Hog Cholera.—Dr. H. B. Mitchell.

Diagnosis of Lameness.—Dr. F. E. Jones.

Cattle Practice.—Dr. F. A. Marshall.

Spaying of Small Animals.—Drs. Castor and Eckart.

Under new business and at the invitation of Dr. R. B. McCord it was voted to hold the next meeting at North East on October 4th.

New Officers elected were: Dr. F. E. Jones, President; Dr. D. R. Royer, Secretary.

Under general discussion, Dr. T. E. Munce, State Veterinarian, gave some interesting facts relative to accredited herd work, hog cholera, abortion and sterility.

The following veterinarians were present: E. A. Anderson, R. B. McCord, M. P. Hendrick, E. S. Pickup, F. E. Jones, T. E. Munce, P. L. Rouse, T. J. Coulter, W. W. Pease, George E. Harry, F. H. Benjamin, H. B. Mitchell, E. Green, W. W. Wilson, F. A. Marshall, E. C. Porter, David R. Royer, Lewis D. Sloan, C. D. Evans, M. R. Smith, E. M. Coover, and A. P. Sturrock.

The ladies who were in attendance enjoyed the many pleasures afforded at Conneaut Lake.

D. R. ROYER, *Secretary*.

MINNESOTA STATE VETERINARY MEDICAL ASSOCIATION

The twenty-third semi-annual meeting of the Minnesota State Veterinary Medical Association, was held at Austin, Minnesota, July 22nd and 23rd. There was a much larger attendance than was anticipated. One hundred and twenty-five veterinarians were in attendance.

Dr. C. A. Nelson, of Brainerd, read a very interesting paper on "Rumenotomy." This was followed by a paper on "Glandular Substance in Medicine," by Dr. N. S. Mayo, of Chicago.

Many new things were brought up by Dr. Mayo, as regards the application of the newer scientific discoveries of the internal secretions of the different glands of the body. Following this discussion, the subject of "Prices for Veterinary Services" was opened by Dr. N. L. Nelson, of Ames, Iowa. Considerable discussion was brought up under this topic, and it was voted that a committee should be appointed by the President to investigate the whole question of veterinary prices, and report at the next meeting. The following committee was named: Dr. J. N. Gould, of Worthington; Dr. C. A. Nelson, of Brainerd, and Dr. A. F. Lees, of Red Wing. In the evening, an address of welcome was given by Mr. J. N. Nicholson, and the response for the Association was made by Dr. Lees.

Following this, a special program on sheep and their diseases was given. Sheep raising was presented by Professor Philip A. Anderson, of the University of Minnesota, non-parasitic diseases by Dr. W. L. Boyd, and parasitic diseases of sheep (illustrated) by Dr. C. P. Fitch.

On Friday a report of the State Veterinary Examining Board was given by Mr. A. J. Tupa, Executive Secretary. This was followed by a most interesting discussion on the army veterinarian, by Captain J. H. Gould, who has just recently been graduated from the War College, Washington, D. C.

The last paper for the morning was given on "Control of Black-leg," by Dr. J. F. Shigley, of St. Paul. In the afternoon all the veterinarians were taken in automobiles to the packing house of George A. Hormel Co., where a display of various pathological specimens was arranged. Dr. W. L. Boyd demonstrated by means of specimens, the diagnosis of pregnancy in bovines, the various changes which occur during pregnancy, and the diseases of the genital tract.

Nineteen new members were admitted to membership.

C. P. FITCH, *Secretary*.

OKLAHOMA NOTES

The State Veterinary Association held its summer meeting at the Huckins Hotel, Oklahoma City, July 6 and 7.

The program was furnished by home talent, the principal subjects for discussion being ethics and tuberculosis control.

The officers elected for the coming year are:

C. H. Anthony, President.

J. E. Nance, Vice-President.

C. H. Hooker, Treasurer.

H. W. Ayres, Secretary.

The customary banquet was held at the Huckins Hotel with Dr. D. W. Gerber officiating as toastmaster.

In keeping with the times the annual dues were doubled.

Fifteen new members were initiated.

Dr. W. F. Taylor, formerly with the B. A. I., at Chicago, has been employed by the Western Weighing Association to supervise the loading of fresh meat cars at Oklahoma City. Special attention will be paid to the temperature of cars and coolers. This opens another field for veterinarians.

Dr. C. L. Nelson, formerly with the Extension Division of the

U. S. Department of Agriculture, has resigned and entered the service of the Oklahoma National Stock Yards Company as a field agent to stimulate the production of more and better livestock, especially sheep.

J. S. GROVE.

NEVADA STATE VETERINARY ASSOCIATION

The Nevada State Veterinary Association held its sixth meeting on July 5, 1920, in Reno, Nevada. The meeting consisted of a clinic in the forenoon at Dr. George E. Bamberger's hospital and a literary session in the evening at the Veterinary Department of the University of Nevada.

At the evening session Dr. W. E. Harrison, located at Fallon, Nevada, recounted his experiences with the veterinary corps of the American Expeditionary Forces in Siberia, and Dr. W. B. Earl read a paper on "The Classification, Preparation and Real Function of Veterinary Biologic Products."

The meeting was presided over by Dr. Robert Dill and was attended by half of the active members.

On the suggestion of the president, the meeting urged further investigation of the milk and meat situation in the city of Reno and the appointment of a committee to coöperate with the City Council in establishing a satisfactory system for the sanitary supervision of these products.

STEPHEN LOCKETT, *Acting Secretary.*

PRINCE EDWARD ISLAND ASSOCIATION

At a recent session of the Provincial Legislative Assembly, an Act to incorporate the Prince Edward Island Veterinary Medical Association, and investing in the Council of the organization the control of veterinary practice, was fully ratified.

In order to avoid the antagonism of rural members of Parliament, a provision was made to register all persons who were five years in active practice, whether they were graduates or empiric practitioners.

Some features of the act are, that no branch of veterinary science is excluded and that castration, vaccination and preventive public health veterinary work must in future be done by qualified men, and that all non-qualified practitioners must submit to examination before their names are placed on the register. The Examining

Board and Council appointed to administer the act include the following: Examining Board: Hon. Geo. E. Hughes, M.P.P.; J. A. Allen, V.S., B.V.S.C.; W. G. Church, V.S. Council: A. A. Leckie, M.R.C.V.S.; J. D. Cumming; W. G. Church, V.S.; K. W. MacKinnon, V.S.; R. Cameron, V.S.; I. E. Croken, V.S.; J. A. Allen, V.S., B.V.S.C.

K. W. MACKINNON, *Secretary*.

TUBERCULOSIS ERADICATION CONFERENCE

A conference of State and Federal employees and general practitioners engaged in tuberculosis eradication work in the New England States was held at Congress Square Hotel, Portland, Maine, July 13, 14, 15. The following program was carried out:

The Object of the Conference, by Dr. J. A. Kiernan.

Address by Hon. J. M. Whittlesey.

Discussion by Dr. W. H. Lynch, Mr. A. L. Felker, Dr. L. H. Howard, Mr. E. S. Brigham, and Mr. J. J. Dunn.

The Intradermic Tuberculin Test, by Dr. George E. Corwin.

Discussion by Dr. Charles L. Colton and Dr. F. E. Blake.

The Ophthalmic Tuberculin Test, by Dr. A. J. DeFossett.

Discussion by Dr. A. E. Bancroft, President Vermont Veterinary Medical Association, Dr. L. M. Adams and Dr. John W. Herman.

The Subcutaneous Tuberculin Test, by Dr. H. B. Leonard.

Discussion by Dr. Arthur L. Edmunds, Dr. W. A. Nannery and Dr. P. T. Keeley.

Combination Tuberculin Testing, by Dr. L. B. Ernest.

Discussion by Dr. Charles L. Colton and Dr. F. J. Bardsley.

Discussion regarding rendition of report of field work and indemnity claims, also discussion of regulations pertaining to tuberculosis eradication work, led by Dr. A. E. Wight of Washington, D. C.

The technique of various tuberculin tests was conducted at Portland Abattoir, by Drs. H. B. Leonard, A. J. DeFossett and G. E. Corwin. The conference attended the banquet and meeting of the Maine Veterinary Medical Association on the evening of the 14th.

Last year the conference was held in Chicago and was national in character, but it was thought that greater results at less expense and greater representation from each State could be had if this year the conference were sectional. It is a compliment to the State of Maine, which is deserved in view of the fact that her rank in the

nation in the tuberculosis eradication work is fourth. So praiseworthy has been her effort and advanced her work that the Bureau of Animal Industry has recently taken its representative, Dr. J. B. Reidy, from the immense areas of the largest State, Texas, and stationed him in Maine, which is obviously becoming a State wherein healthy cattle are coming to be the order of things.

Dr. J. A. Kiernan, chief of the Tuberculosis Eradication Division, opened the session with an address upon the subject of the conference. He said that tuberculosis was threatening the live-stock industry of this country, alarming the owners of purebred cattle because it was increasing at rate of one per cent a year. Therefore a campaign was decided upon and Congress asked for an appropriation to enable the work to be carried forward. In 1917 an appropriation of \$75,000 was granted for the control and eradication of the disease and in 1917 the Tuberculosis Eradication Division was formed.

Hon. J. M. Whittlesey was among the first speakers of the conference. He claimed that 20 per cent of the tuberculosis cases among children in Connecticut was due to infected milk, and in that statement lies the reason for the interest Connecticut takes in the eradication of tuberculosis among cattle. It is a matter of public health. This meeting was held in the sun parlor of the Congress Square Hotel and about 75 veterinarians from all the New England States were present, together with visitors from the State of New York and District of Columbia.

The idea of the conference is to assemble the workers of the different States together and to pool experiences, with the view of making the nation-wide work more efficient.

The particular aim of this conference was to decide if possible on the best of the three known tests for discovering tuberculosis among cattle. At such meetings nothing is kept under cover and the work goes forward at an enthusiastic and tireless rate, while men endeavor to demonstrate that scientific testing of herds is a means of stamping out tuberculosis.

In the discussion following the speech of Mr. Whittlesey, Mr. Felker suggested that all New England States have uniform laws regarding control of live-stock diseases within the borders.

The next speaker was Dr. Corwin, of Connecticut, and he addressed the assembly on the fine points of the intradermic test. He observed with gratitude the great interest in the work and went on to tell how his State was in the market for 5,000 head of dairy cattle annually and that until the past two or three years she was the dump-

ing ground for tuberculous cattle until the eradication work was fairly started. For some time the subcutaneous tuberculin test has been the only recognized one. Today there are three reliable tests, of which in the opinion of Dr. Corwin the intradermic test can be used with less complications. It can be used at any time, in any weather and place, and does not depend upon several phenomena. In the minds of many veterinarians it has a great future and is received with growing confidence and growing popularity. Dr. Corwin believes no herd can be called free of tuberculosis without passing this test.

Dr. A. J. DeFossett was the next speaker, with arguments in favor of the ophthalmic test, which is almost in exclusive use in Vermont and which always succeeded when the old subcutaneous method proved a failure. He claimed the same value for the ophthalmic tests as did the previous speaker for the intradermic, and that no herd can be called healthy until it has passed the ophthalmic test.

It was the duty of Dr. H. B. Leonard, of New York, to uphold the honor of the subcutaneous method, which was more or less disparaged. He declared that this method was the most reliable, while admitting that many incidents seem to show it had less favorable qualities, and caused much smiling when he said it was one of the accurate tests. Dr. L. B. Ernest, of Washington, D. C., was the advocate of all three methods, as none of them was absolutely efficient by itself. He declared that the combined test was necessary and that research has shown that this combined method has never missed a case.

An interesting discussion followed the close of the formal addresses and many individual experiences were offered. The large assembly convened to discuss these matters was commented upon and Dr. J. B. Reidy, who represents the Bureau of Animal Industry in Maine, said it was one of the most important meetings of the kind in the country. Speaking of the efforts of men to decrease the rate of tuberculosis, which was described as one of the greatest menaces to human life, he said they had begun to control it in its most vital agency, cattle.

The afternoon was passed with the Maine Veterinary Medical Association, with the President, Dr. W. H. Lynch, who is also Livestock Sanitary Commissioner of the State of Maine, in the chair.

There was a good deal of routine business, reception and disposal of reports.

The great social event of the second day of the conference was

the banquet at the Congress Square Hotel in the evening. There were many able speakers and much interest was paid their utterances. Dr. W. H. Lynch opened these addresses by speaking of the conference as one of the most instructive and important since their coöperation with the Bureau of Animal Industry. He said this additional work for the doctors increased their efficiency and experience and spoke with pleasure of the gradual elimination of the empiric, which makes for higher educational standards. With the contempt of the true veterinarian for automobiles, he told a story of a small boy who claimed that horses were superior, for "if you have horses, you can raise horses, but if you have automobiles, nothing will raise them but a jack."

The toastmaster for the evening, Dr. E. A. Crossman, of Boston, Mass., made a little speech on his own account, in which he told of the important work which had been done in tuberculosis eradication, saying it is the most important work ever undertaken by any nation. He introduced as the speaker on this topic the chief of the division, Dr. J. A. Kiernan, of Washington, D. C.

Dr. Kiernan spoke about the wonderful work of Dr. Corwin during the day and said that if his diagnosis and deductions proved as accurate in all cases, he was indeed the super-veterinarian. He said a good word for the old subcutaneous test which had been in use thirty years. Dr. Kiernan is a ripe scholar with attainments in other fields than veterinary science, as he easily demonstrated in his fine address, which showed a familiarity with many subjects. He was warmly applauded as he sat down.

The next speaker was Dr. F. Torrance, Veterinary Director General of Canada, and he told of the work being done in the veterinary college in Toronto. He spoke of the friendly feeling between Canada and the United States and spoke of the efforts to end the pernicious correspondence schools. His speech contained graceful felicitations upon the good feeling between the United States and Canada.

Before introducing the next speaker, Dr. H. L. Howard, who spoke for the ladies, Dr. Crossman talked very earnestly about the besetting sin of the veterinarian in being too modest in proclaiming his deeds and efficiency in promoting the health of the nation. He said the Panama Canal was an after effect of the Bureau's work in proving that a disease could be carried by insects. He said the veterinarians had controlled hog cholera and reduced scabies to

lessened proportions and told of the work they are doing along the borders of the country to prevent entrance of disease in livestock.

Dr. Howard was followed by Commissioner A. L. Felker, of New Hampshire, who proved to be the silver-tongued orator of the evening.

Hon. J. M. Whittlesey, of Connecticut; Dr. A. E. Wright, B. A. I.; Dr. DeFossett, of Vermont; Dr. Cook, of New Brunswick; Dr. Maloney, Fall River, Mass.; Dr. Smith, Hartford, Conn., and Dr. Reidy, B. A. I., all spoke briefly and in high terms of the benefits of the conference to the public at large, and stated that after fifty years of struggle the profession is at last being recognized as a factor in the life and health of the nation.

W. H. LYNCH, *President.*

P. R. BAIRD, *Secretary.*

Dr. S. F. Musselman, State Veterinarian of Kentucky, writing in advocacy of better breeding for live stock improvement, emphasizes the fact that females of the beef type should be bred to beef bulls, and that females of the dairy type, regardless of breed or class, should be bred to dairy bulls.

Recent experience is demonstrating that the mule will beat gasoline power. * * * In the Middle West and East it is being found that mules and horses are better for work in many places where it once seemed that the tractor would predominate.—*Breeder's Gazette.*

President Wilson has been enrolled in the "Better Sires—Better Stock" campaign. The sheep that graze the White House lawn are the President's personal property and make him eligible for participation in the nation-wide effort to improve live stock in the United States.

It is a great relief to horsemen everywhere to know that there is no longer any doubt about the draft horse coming back. There is not a single indication anywhere to lead farmers to think that maybe they ought not to breed their big mares this spring.—*Rural World.*

New England Farms, in an article on the progress of tuberculosis eradication work, says: "The eradication work is not only fundamentally sound but owners of herds may as well make up their minds that the time is coming when an untested herd won't stand a ghost of a show."

MISCELLANEOUS

INDUSTRIAL RESEARCH LABORATORIES IN AMERICA

A bulletin just issued by the National Research Council lists more than three hundred laboratories maintained by industrial concerns in America, in which fundamental scientific research is carried on. The bulletin gives a brief account of the personnel, special equipment and particular kind of research carried on in each of the laboratories listed.

Industrial research laboratories have increased notably in number and activity, both in America and Great Britain, since the beginning of the war, because of the lesson vividly taught by the war emergency. It was only by a swift development of scientific processes that the Allies and America were able to put themselves in a position first to withstand and then to win a victory over Germany's science-backed armies and submarines. And it is only by a similar and further development that America and the Allies can win over Germany in the economic war-after-the-war, now being silently but vigorously waged.

FILMS TO INTRODUCE UNITED STATES LIVE STOCK IN SOUTH AMERICA

Introduction of American breeds of live stock and poultry into South America, particularly Argentina, is to be aided by the use of motion picture films prepared for this purpose by the United States Department of Agriculture. The films also will show American methods of breeding live stock and handling it in its many phases from the farm to the home table.

The Argentine Government has shown special interest in the introduction of American methods of handling live stock. The Argentine Embassy at Washington has already purchased ten films on these subjects for educational use in its country. It has frequently had the Department's bulletins on agricultural questions translated into Spanish for distribution in Argentina.

The Buenos Aires and Pacific Railway has been another purchaser of films and still pictures for use along its system. Its representative in this country recently called at the Department in quest of films showing the swine industry in the United States. He was enthusiastic over the opportunity of almost immediate success if efforts were concentrated on the introduction of American swine into

Argentina. He proposed that a film be prepared by the Department showing the swine industry in the United States, which could be used along the routes of that railway system.

The Bureau of Animal Industry welcomed the suggestion, and preparations are being made for filming the various interesting phases of the subject. It is planned to show important swine-breeding farms, the work in the big Chicago packing houses, and the preparation of the product for the table. Pictures will be made of the various types of American hogs, and an effort will be made to give some idea of the vastness of the industry in this country.

SCRUB COWS IN SOCIETY

Mrs. Scrub Dairy Cow is about to break into the upper class of dairy society. Madam Scrub will parade with the blue-blooded aristocracy of the cattle world. The United States Department of Agriculture expects to exhibit a grade family consisting of a purebred sire, a scrub cow, and the grade offspring of this mating at the National Dairy Show to be held at Chicago in October, 1920. Some of the cattle clubs will also have similar exhibits.

The purpose of this feature is to interest the owners of scrub and low-grade herds and to show in a practical way the manner in which such a herd may be improved by the use of a purebred sire. This will do much to combat the prevailing idea that the National Dairy Show is of interest only to the owners of purebred herds. It will help also to advertise the fact that the United States Department of Agriculture, through its "better sires" campaign, is offering co-operation and aid to the owner of the poorest herd as well as to the owner of improved stock.

After all, Mrs. Scrub doesn't get into society on the strength of her own qualities; she is accepted purely on account of the merits of her mate and her progeny.

As we go to press, information is received to the effect that rinderpest has appeared in Belgium, but its exact location and degree of prevalence are not available as yet.

What is said to be the biggest steer in the world, measuring eighteen hands, and weighing 3,200 pounds, has been given to the Y. M. C. A. of Fort Worth after having been on exhibition at the Fat Stock Show at that place.—*Semi-Weekly Farm News*.

CONVENTION NOTES

Members of the A. V. M. A. came to the Columbus meeting in automobiles from as far west as the Mississippi River and as far east as Washington, D. C.

Des Moines was a formidable competitor and the only serious contender with Colorado Springs for next year's convention.

The constructive measures recommended by President Cary in his address and by the Committee on Intelligence and Education in its report were important features of the meeting.

A reunion of the World War Veterinarians of America was held at Columbus and Dr. L. A. Merillat was reelected president.

Among the older practitioners who attended the Columbus meeting were Drs. W. Horace Hoskins, W. G. Hollingworth, Otto Faust, Ben Pierce, S. Brenton, E. H. Shepard, William Herbert Lowe, David Cochran, W. Runge, A. S. Cooley and Nicholas Rectenwald. The early arrivals on Saturday found Dr. Faust already on hand. Dr. Rectenwald has been in active practice fifty-two years.

It was with deep feelings of regret that those of us who are accustomed to attend the A. V. M. A. meetings noted the absence of the late Drs. John F. Winchester and Joseph Hughes. Both were regular attendants and staunch supporters of the Association.

E. S. Bayard, editor of the *National Stockman and Farmer* and an honorary member of the A. V. M. A., delivered the most impressive and constructive address of the convention. His many helpful suggestions, given in a common-sense manner and illustrated by many humorous stories, will be read with profit by those who were unfortunate enough to be absent. At its conclusion a rising vote of appreciation was extended to Editor Bayard.

The National Association of Bureau of Animal Industry Veterinarians held its annual convention, as usual, in conjunction with the A. V. M. A. meeting. This was the third successful meeting of this association. Sixty delegates were present and important business matters were discussed.

The Ohio Clover Leaf Party for the ladies was held at the Deshler Hotel, with esthetic dancing, music and readings on the program. The recitations by Mrs. Fonsa A. Lambert of selections from the writings of Paul Lawrence Dunbar were very clever. Beautiful crystal prizes were awarded to the following ladies who were fortunate enough to hold cards bearing four-leaf clovers: Mrs. C. W. Sass, Mrs. Starnbaugh, Mrs. Aulger, Mrs. S. R. Craver, Mrs. T. E. Anderson and Mrs. A. T. Kinsley.

Eighty-three graduates of the Ontario Veterinary College attended the alumni banquet of that institution given at the Deshler Hotel on Tuesday evening. Steps were taken to provide a fund for the erection of a suitable memorial to the late Prof. Andrew Smith.

One of the many constructive actions taken at the Columbus convention was the inauguration of the Practitioners' Club of the A. V. M. A. with Dr. E. H. Shepard of Cleveland as chairman. The object of the club is to discuss and act on subjects pertaining to the welfare of the general practitioner. The annual meetings will be held on the first day of the national convention each year or at any other time deemed necessary by the chairman.

At its final meeting the Executive Board elected Dr. George Hilton of Ottawa, Canada, as its chairman, to succeed Dr. Charles H. Stange, whose term on the board expired.

Chairman Hilton of the Executive Board has appointed the following Sub-Committee on Journal: Drs. Kinsley, Bennett and Kiernan.

The fourth annual meeting of the Ladies' Auxiliary of the A. V. M. A. was held Monday, August 23, in Memorial Hall. A short but interesting program was presented, followed by the election of the following officers: President, Mrs. A. T. Kinsley, Kansas City, Mo.; First Vice-President, Mrs. D. S. White, Columbus, Ohio; Second Vice-President, Mrs. F. A. Lambert, Columbus, Ohio; Treasurer, Mrs. H. P. Hoskins, Bedford, Mich.; Recording Secretary, Mrs. A. J. Wilder, Akron, N. Y.; Corresponding Secretary, Mrs. Ashe Lockhart, Kansas City, Mo.

Any practitioner confronted with the problem of reducing the losses due to bovine contagious abortion should consider the advantages of the

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Single Injection Bovine Abortion Bacterin (Mixed)

A sterile product—free from all living bacteria.

No danger of continuing the spread of infection and subsequent sterility with this product in the virgin heifer

The development of this product by our research department places in the hands of every practitioner a safe product and a most practical product, especially in view of the fact that only one trip to the farm is necessary.

ADMINISTRATION AND DOSAGE

The single injection of a large number of killed organisms furnishes a very marked stimulation of antibodies. In fact, some prominent authorities state that the single large injection of a heated bacterial suspension causes equally as strong antibody production as after several injections of the same quantity. (Experiment Station Record, Vol. 42, No. 2.)

The secondary complications following abortion which result in sterility are not due to the abortion bacillus. In fact, the abortion organism can only be found in the uterus on rare occasions. The secondary infections such as the *B. pyogenes*, streptococci and staphylococci are the predominating organisms. They are of low virulence and produce a chronic condition. Irrigation methods do not reach the seat of infection. The resistance of the animal should be increased by the injection of the killed cultures which are incorporated in the single injection Bovine Abortion Bacterin (Mixed).

The injection of the 20-mil dose should be made subcutaneously on or before the ninetieth day of pregnancy to obtain the most favorable results. The injection of this heavy suspension after the fourth or fifth month of pregnancy may cause abortion.

Sanitary precautions should be observed in the control of abortion, such as quarantine of newly purchased animals, isolation stables for cows during parturition and destroying all contaminated food, bedding and litter and the liberal use of a disinfectant of known germicidal strength.

Per vial 20 mil (1 treatment).....\$1.00
Per vial 200 mil (10 treatments)..... 9.00

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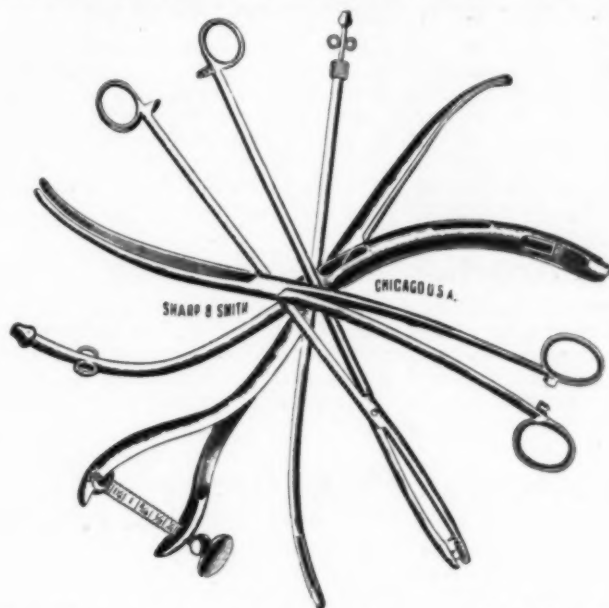
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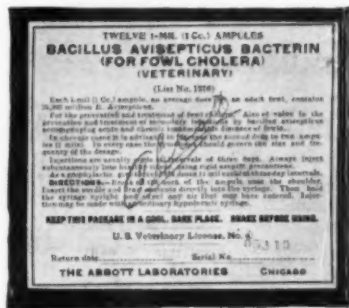


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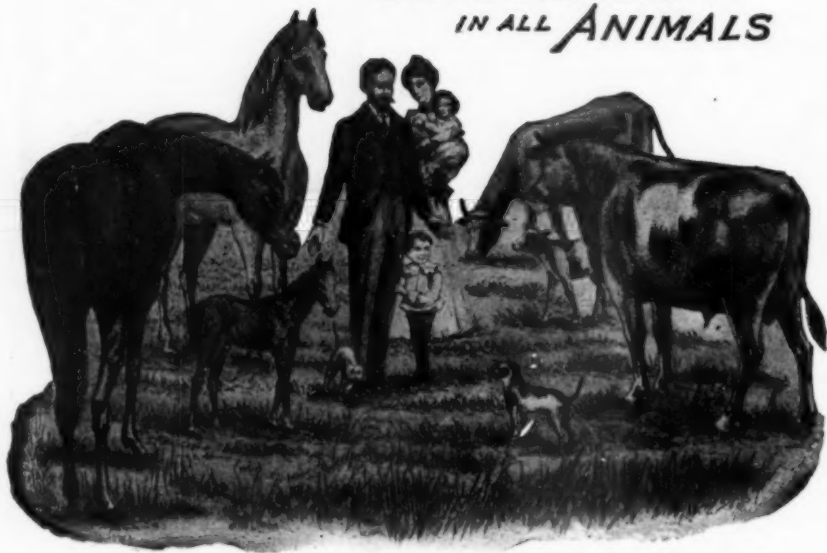
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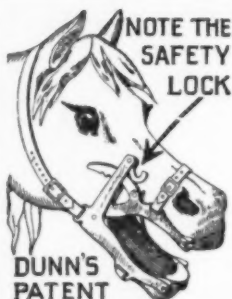
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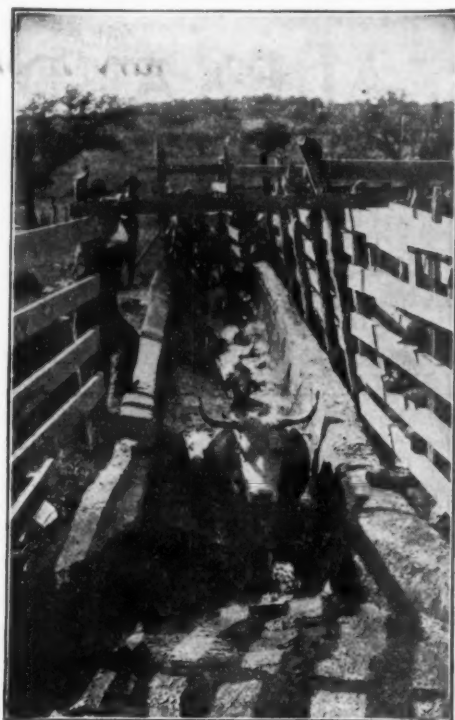
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Secretaries of Veterinary Associations are requested to cooperate with us in keeping this directory up to date.

Name of Organization	Date of Next Meeting	Place of Meeting	Name and Address of Sec'y.
Alabama Vet. Med. Ass'n.....	.....	Birmingham.....	C. A. Cary, Auburn
Alumni Ass'n College of Vet. Med. O. S. U.....	.....	Columbus.....	W. R. Hobbs, care O. S. U. Columbus, Ohio
Alumni Ass'n N. Y.-A. V. C.....	June, 1920.....	338 E. 26th St.....	Adolph Eichhorn, Pearl River
Alumni Ass'n U. S. Coll. Vet. Surgeons.....	.....	Wash., D. C.....	Mendham, N. J.
American Vet. Med. Ass'n.....	Aug. 23-27, 1920	Columbus, O.....	N. S. Mayo, 4753 Ravenswood Ave., Chicago
Arkansas Veterinary Ass'n.....	.....	.....	R. M. Gow, Little Rock
B. A. I. Vet. Ass'n of Iowa.....	.....	Ames, Ia.....	F. Jelen, Cedar Rapids, Ia.
B. A. I. Vet. In. A., S. Omaha.....	3d Mon. each mo.	S. Omaha, Neb.....	J. V. Giffie, So. Side, Omaha
British Columbia Vet. Ass'n.....	.....	.....	K. Chester, New Westminster B. C.
California State V. M. Ass'n.....	June.....	Fresno.....	J. P. Bushong, Los Angeles
Central Canada V. Ass'n.....	.....	.....	A. B. Wickware, Ottawa
Central N. Y. Vet. Med. Ass'n.....	June and Nov.....	Syracuse.....	W. B. Switzer, Oswego
Chicago Vet. Society.....	2d Tu. each mo.....	Chicago.....	A. A. Leibold, Chicago
Colorado State V. M. Ass'n.....	.....	Denver.....	I. E. Newsom, Ft. Collins
Conestoga Veterinary Club.....	2d Thur. each mo.....	Lancaster, Pa.....	H. B. Brady
Connecticut V. M. Ass'n.....	.....	.....	A. T. Gilyard, Waterbury
Dominion Vet. Meat Inspectors' Ass'n of Canada.....	3d Sat. each mo.....	Toronto.....	Wm. Tennant, Toronto
Eastern Iowa Vet. Ass'n.....	Muscatine.....	S. E. Houk, Muscatine
Genesee Valley V. M. Ass'n.....	Rochester.....	J. H. Taylor, Henrietta, N. Y.
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Hudson Valley V. M. A.....	W. H. Kelly, Albany
Idaho Ass'n Vet. graduates.....	C. V. Williams, Blackfoot
Illmo Vet. Med. Ass'n.....	Oct. 1920.....	Collinsville, Ill.....	L. B. Michael, Collinsville, Ill
Illinois State V. M. Ass'n.....	.....	.....	L. A. Merillat, Chicago
Indiana Veterinary Ass'n.....	.....	.....	G. H. Roberts, Indianapolis
Iowa Veterinary Ass'n.....	.....	Ames.....	H. D. Bergman, Ames
Kansas State V. M. Ass'n.....	.....	.....	W. J. Guilfoyle, Kansas City
Kentucky V. M. Ass'n.....	.....	Louisville.....	H. Gieskemeyer, Fort Thomas
Louisiana V. M. Ass'n.....	.....	.....	E. I. Smith, Baton Rouge
Maine Vet. Med. Ass'n.....	.....	Portland.....	E. E. Russell, Farmington
Massachusetts Vet. Ass'n.....	Monthly.....	Quincy House Boston.....	
Michigan State V. M. Ass'n.....	.....	.....	F. M. Blatchford, Brighton
Minnesota State V. M. Ass'n.....	.....	Brainerd.....	C. P. Fitch, St. Paul
Mississippi State V. M. Ass'n.....	Jan. 25-26, 1921.....	Carton, Miss.....	J. A. Barger, Jackson
Missouri Valley V. Ass'n.....	July 12-14, 1920	Omaha, Neb.....	R. F. Bourne, Ft. Collins, Col
Missouri Vet. Med. Ass'n.....	.....	.....	Chas. D. Folse, Kansas City
Montana State V. M. A.....	.....	Butte.....	A. D. Knowles, Missoula
Nat'l Ass'n B. A. I. Veterinarians.....	Meet with A. V. M. A.....	S. J. Walkley, 945 39th St. Milwaukee, Wis.
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New Jersey State V. M. Ass'n.....	Asbury Park.....	
New York S. V. M. Society.....	July 21-23, 1920	Ithaca.....	C. E. Hayden, Ithaca
North Carolina V. M. Ass'n.....	.....	.....	J. P. Spoon, Burlington
North Dakota V. M. Ass'n.....	July 13-14.....	.....	R. S. Amadon, Fargo
North-Western Ohio V. M. A.....	.....	.....	C. E. Hershey, Tiffin, O.
Ohio State V. M. Ass'n.....	.....	.....	R. I. Bernath, Wauseon
Ohio Tri-County Vet. Ass'n.....	.....	.....	Dr. W. R. Lukens, Hillsboro
Ohio Valley Vet. Med. Ass'n.....	.....	.....	C. S. Henry, Terre Haute
Oklahoma State V. M. Ass'n.....	July, 6-7, 1920.....	Oklahoma City.....	D. W. Gerber, Okla. City, Ok.
Oregon Vet. Med. Ass'n.....	B. T. Simms, Corvallis, Ore
Pennsylvania State V. M. A.....	Harrisburg.....	R. M. Staley, Ardmore
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Portland Vet. Med. Ass'n.....	4th Tu. each mo.....	Portland, Ore.....	Sam. B. Foster, Portland, Ore.
S. Carolina Ass'n of Veter'ns.....	July 13, 1920.....	Union.....	B. K. McInnes, Charleston
Schuykill Valley V. M. A.....	.....	Reading.....	C. R. Pottelger, Reading
South Dakota V. M. A.....	.....	.....	S. W. Allen, Watertown
So. Aux. of Cal. S. V. M. Ass'n.....	3d Wed. Dec., Mar., June, Sept.	Los Angeles.....	J. A. Dell, Los Angeles
Southeastern Michigan V. M. Ass'n.....	2d Wednesday Jan. Apr. Jul. Oct.	.....	H. Preston Hoskins, Detroit
Southeastern States Vet. Med. Ass'n.....	.....	Birmingham, Ala.....	H. C. Hutchens, Atlanta, Ga.
Southern Tier V. M. A.....	Binghamton.....	R. R. Birch, Ithaca, N. Y.
Southwestern Mich. Vet. Med. Ass'n.....	L. A. Winter, Eau Claire, Mich

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Texas V. M. Ass'n.....	Fort Worth.....	T. T. Christian, Waco.
Utah Vet. Med. Ass'n.....	October, each yr..	Salt Lake City...	Hugh Hurst
Vermont Vet. Med. Ass'n.....	.....	.....	Geo. Stephens, White River Junction
Vet. Ass'n of Alberta.....	July and Dec.....	.....	T. E. Leclaire, Calgary, Alta.
Vet. Club Dist. of Columbia....	.....	.....	F. W. Grenfell, Wash'n., D.C.
Vet. Ass'n of Manitoba.....	.....	Winnipeg.....	Wm. Hilton, Winnipeg
Vet. Med. Ass'n of N. J.....	.....	Asbury Park.....	J. H. Hoffman, Paterson
V. M. Ass'n., New York City..	1st Wed. ea. mo..	338 E. 26th St...	Dr. J. E. Crawford, Far Rockaway, N. Y.
Virginia State V. M. Ass'n....	.....	Ocean View.....	W. G. Chrisman, Blacksburg, Va.
Washington State Col. V. M. A.	1st and 3d Fri. eve	Pullman.....	John H. Gooding, Pullman
Washington State V. M. A.....	.....	.....	Carl Cozier, Bellingham
Washington Vet. Med. Ass'n....	Fri. each week...	Wash., D. C.....	L. C. Wambaugh, Wash., D.C.
Western N. Y. V. M. A.....	.....	Buffalo.....	F. F. Fehr, Buffalo
Western Penn. Vet. Club.....	3d Tu. each mo..	Pittsburgh.....	Fred Wietzel, Pittsburgh
W. Virginia Vet. Med. Ass'n....	E. Layne, Huntington, W. Va.
Wisconsin Vet. Med. Ass'n.....	Appleton.....	W. A. Wolcott, Madison
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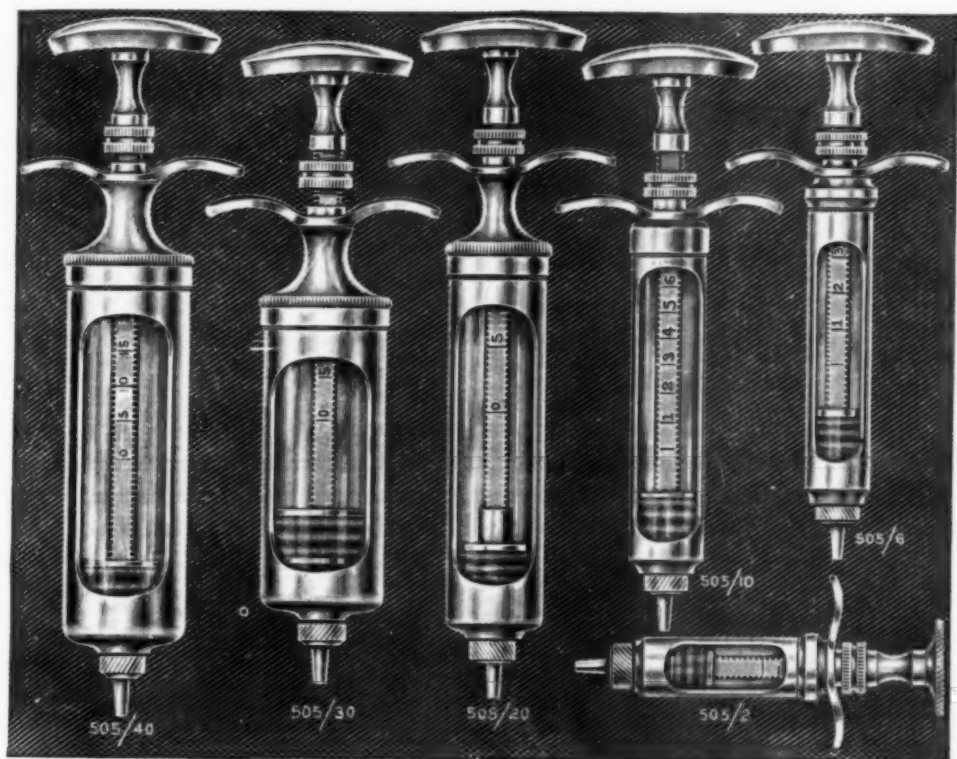
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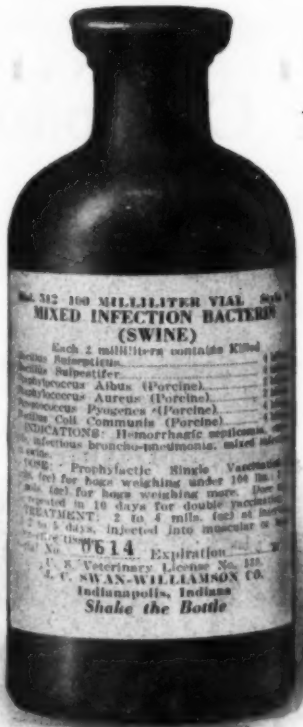
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Abortion disease of cattle causes losses to the dairy industry which equal and probably surpass those incurred from tuberculosis. Very few dairy herds of any size escape the infection, with its attendant evils of impaired milk flow, sterility, abortion, difficult parturition, retained afterbirth, and loss of the calf crop.

Extensive field experiments conducted in England show that while protection against contagious abortion is afforded by bacterin (suspensions of killed *B. abortus bacilli*) immunization, much better results are obtained where true vaccines (living *B. abortus bacilli*) are employed. The report of the English Commission has been confirmed by experimental work in this country. In addition to better protection from the use of *B. abortus* vaccine, immunization may in most instances be accomplished by a single inoculation. Statistics compiled by the English Commission show that abortions were reduced to less than 4% by vaccination with *B. abortus* vaccine (living organisms).

Immunization—Two products are available for the prophylactic immunization of cattle against Contagious (Infectious) Abortion: *B. Abortus Bacterin*, a sterile suspension of many strains of killed *B. abortus bacilli*, and *B. Abortus Vaccine*, a living culture of many strains of *B. abortus bacilli*.

JANUARY 1, 1920

Note New Net Price

We prepay all Shipping Charges

Order from Berkeley, Calif., or 180 N. Dearborn St., Chicago, Ill.

THE CUTTER LABORATORY

Cutter's B. Abortus Bacterin has been extensively employed with satisfactory results for the immunization of cows against abortion disease. It is safe to use and for this reason should always be the choice of the operator for the immunization of animals in herds which do not have a definite history of infection.

Cutter's B. Abortus Bacterin is supplied in packages containing four 2 c. c. bottles, serial dosage. Injections of the bacterin are made subcutaneously in the shoulder or neck region. The content of bottle No. 1 is given first and is followed at an interval of five to ten days by the injection of the content of bottle No. 2. The content of bottle No. 3 is next given and then No. 4, the intervals between injections being the same (five to ten days). It is always best to give the vaccine treatment following parturition or abortion and before breeding. If it is desired to treat infected cows during pregnancy, B. Abortus Bacterin should be employed and the treatment given as early as possible. It is not desirable to begin treatment during the last three months of pregnancy.

Cutter's B. Abortus Vaccine (living culture of B. abortus bacilli) is supplied for use on known infected herds. B. Abortus Vaccine since it contains the living organisms will give a higher and more durable immunity than may be obtained from B. Abortus Bacterin. Only one injection of vaccine is usually required. The vaccine is injected subcutaneously, observing the usual aseptic precautions, in the neck or shoulder region. The dose of Cutter's Abortus Vaccine is 5 c.c. and the treatment should be given following parturition or abortion and before breeding.

Cutter's B. Abortus Bacterin:

	<u>LIST</u>	<u>NET</u>
Package of four 2 c.c. bottles.....	\$1.00	\$.60

Cutter's B. Abortus Vaccine (Living):

	<u>LIST</u>	<u>NET</u>
Package of 50 c.c. (10 doses).....	\$10.00	\$6.00

Anthrax

Cure and Prevention

In California, Texas and Louisiana as in other states in which Anthrax is prevalent, Cutter's Anthrax Vaccine and Anti-Anthrax Serum are the recognized best insurance against losses from Anthrax.

In certain badly infected territory they gave positive protection where others failed; and wherever used their superiority over others has been established by comparison of results.

To Prevent Anthrax, the Serum-Vaccine simultaneous method is recommended, though users who have had good results year after year from the use of Cutter's Anthrax Vaccine "alone" still continue this practice.

To Cure Anthrax—Thousands of head have been saved during the last four years by the use of Cutter's Anti-Anthrax Serum in virulent outbreaks on badly infected land.

Write for Special Literature concerning these products, which are prepared in our new special Anthrax plant, the largest and most up-to-date in the world, devoted exclusively to the production of Anthrax Vaccines and Anti-Anthrax Serum.

JANUARY 1, 1920

Note New Net Price

We prepay all Shipping Charges

Order from Berkeley, Calif., or 180 N. Dearborn St., Chicago, Ill.

THE CUTTER LABORATORY

Hemorrhagic Septicemia and Mixed Infection Vaccines for Swine

A Plain Talk About Dosage

The organisms which cause Hemorrhagic Septicemia and Mixed Infection Disease in Swine are of a type that vaccines prepared from and properly representative of the varying strains of organisms concerned cause considerable reaction when given in overdose to susceptible animals.

It is also true of all good vaccines prepared from these organisms that while the proper initial dose will produce a high degree of immunity a second and larger dose, five to seven days later, will increase both the degree and persistence of this immunity. The same may be said of a third dose, but for all practical purposes a second dose is sufficient.

Now it would be very easy for us to follow the line of least (advertising) resistance and dilute our vaccines down to a point where "a liberal dose" (4 c.c. or any other quantity) could also be recommended by us. We could also depend on the very satisfactory results usually obtained from a single dose and say nothing about the desirability of giving a second and larger dose, five to seven days later, when conveniently possible.

But we prefer to give the veterinarian the benefit of the knowledge of these facts so that he may apprise the stock-owner and let him use his own judgment as to whether or not he shall have the second treatment given.

There can be no argument on this point of the advantage of giving a second and larger dose of any prophylactic vaccine, especially as concerns the organisms in question in these diseases.

Cutter's Hemorrhagic Septicemia and Mixed Infections Vaccine (Swine) are of uniformly high bacterial count and are truly representative of the varying strains of the organisms found concerned in the diseases against which they are to be used. Give 2 c.c. (or 3 c.c. to very large animals) in perfect confidence that you are giving all that is necessary to obtain the best results possible to obtain from a single vaccination with any vaccine no matter what the dosage.

If you give a second treatment with any vaccine, the animal is prepared to stand a larger dose than the initial one, and a greater and more persistent immunity will be secured if you double the initial dose.

By giving a larger second dose of a sterile bacterial vaccine (bacterin) you are approximating the results obtained by giving a second dose of a living vaccine (as, for instance, Anthrax Vaccine) that contains living organisms of a higher degree of virulence than those contained in the primary vaccine.

Just keep these facts in mind and you will not be confused by catch-penny talk about "liberal dosage" and, by inference, the consequent lack of necessity of a secondary vaccination.

Even if your client decides that a single vaccination is all that he cares to be bothered with, you will have done your duty by him if you give him the straight facts, and he will have no "come-back," as he might if you said nothing about the desirability of a second treatment.

SUMMARY

Cutter's Hemorrhagic Septicemia Vaccine (Bovine): A sterile suspension of selected strains of *B. bovis* in physiological salt solution. It is a sterile product and may be used with entire safety for the prophylactic immunization of susceptible cattle against hemorrhagic septicemia.

Prophylactic Dose—Give 2 c.c. of vaccine subcutaneously. It should be followed, if possible, by a second injection of 4 c.c. of vaccine five to seven days later.

Cutter's Hemorrhagic Septicemia Vaccine (Sheep): A sterile suspension of *B. Ovis* in physiological salt solution. This vaccine is indicated for the prevention of hemorrhagic septicemia in sheep and goats.

Prophylactic Dose—Give 2 c.c. of vaccine subcutaneously. It should be followed, if possible, by a second injection of 4 c.c. of vaccine five to seven days later.

JANUARY 1, 1920

Note New Net Price

We prepay all Shipping Charges

Order from Berkeley, Calif., or 180 N. Dearborn St., Chicago, Ill.

THE CUTTER LABORATORY

Cutter's Hemorrhagic Septicemia Vaccine (Swine): A sterile suspension of *B. suis* septicus in physiological salt solution. This product is indicated for the prevention of hemorrhagic septicemia (swine plague) in swine.

Prophylactic Dose—Give 2 c.c. of vaccine intramuscularly. It should be followed, if possible, by a second injection of 4 c.c. of vaccine five to seven days later.

Cutter's Mixed Infection Vaccine (Swine): A sterile suspension of selected strains of *B. suis* septicus, *B. cholera suis* (*Suipestifer*), Coliform bacilli, *B. pyogenes*, Streptococci and Staphylococci isolated from cases of mixed infections in swine. The use of Mixed Infection Vaccine (Swine) is advised for the prophylaxis and treatment of swine plague and its complications (mixed infections). Since this product contains not only *B. suis* septicus, but also the important group of organisms so often encountered in the complications following hog cholera and swine plague, usually termed mixed infections, we would advise Veterinarians to select it for general use unless they are certain that the disease with which they are dealing is caused by *B. suis* septicus alone.

All of Cutter's Hemorrhagic Septicemia Vaccines, as well as Cutter's Mixed Infection Vaccine (Swine), are sterile products and may be used without any possible danger of introducing infection. Injections of vaccines in swine should be made intramuscularly with the usual aseptic precautions.

Cutter's Anti-Hemorrhagic Septicemia Serum (Bovine) is a sterile serum prepared from the blood of horses which have been hyperimmunized against many strains of *B. bovis* septicus. It has curative properties and is indicated in the treatment of sick animals. The administration of from 20 to 50 c.c. of this serum will promptly check the spread of the disease among exposed animals in actual outbreaks.

Cutter's Anti-Mixed Infection Serum (Swine) is a sterile serum prepared from the blood of horses immunized against *B. suis* septicus, *B. cholera suis* and selected strains of coliform bacilli all isolated from cases of mixed infection in swine.

When administering serum to swine, make the injections into the loose connective tissue of the armpit, flank, or else deeply

into the muscular tissues. Subcutaneous injections in swine are not satisfactory, as absorption is slow on account of the layer of fat underlying the skin.

Hemorrhagic Septicemia Vaccine (Swine):

	<u>LIST</u>	<u>NET</u>
Bottle containing 20 c.c.....	\$2.00	\$1.20

Mixed Infection Vaccine (Swine):

	<u>LIST</u>	<u>NET</u>
Bottle containing 20 c.c.....	\$2.00	\$1.20
Bottle containing 100 c.c.....	7.50	4.50
Bottle containing 250 c.c.....	17.50	10.50

Hemorrhagic Septicemia Vaccine (Bovine):

	<u>LIST</u>	<u>NET</u>
Package of six 2 c.c. bottles.....	\$1.50	\$.90
Bottle containing 20 c.c.....	2.00	1.20

Hemorrhagic Septicemia Vaccine (Sheep):

	<u>LIST</u>	<u>NET</u>
Bottle containing 20 c.c.....	\$2.00	\$1.20
Bottle containing 100 c.c.....	7.50	4.50

Anti-Mixed Infection Serum (Swine):

	<u>LIST</u>	<u>NET</u>
Bottle containing 50 c.c.....	\$2.00	\$1.20
Bottle containing 250 c.c.....	9.00	5.40
Bottle containing 500 c.c.....	17.00	10.20

Anti-Hemorrhagic Septicemia Serum (Bovine):

	<u>LIST</u>	<u>NET</u>
Bottle containing 50 c.c.....	\$2.25	\$1.35
Bottle containing 500 c.c.....	20.00	12.00

Fowl Cholera Bacterin

For the prevention and treatment of Fowl Cholera or Hemorrhagic Septicemia in Fowls.

Excellent results have been obtained in prophylaxis, and in treatment in the early stages of the disease.

	<u>LIST</u>	<u>NET</u>
10 Doses	\$1.00	\$.60
50 Doses	4.00	2.40
100 Doses	7.50	4.50
250 Doses	17.50	12.50

JANUARY 1, 1920

Note New Net Price

We prepay all Shipping Charges

Order from Berkeley, Calif., or 180 N. Dearborn St., Chicago, Ill.

THE CUTTER LABORATORY

Influenza Mixed Vaccine (Equine)

Prepared from many freshly isolated strains of streptococci (S. Equi) and staphylococci from typical cases of equine distemper and influenza.

Indicated in the prophylaxis and curative treatment of distemper, strangles, influenza, shipping fever, pneumonia, as well as in all complications and sequelæ of these diseases.

<u>PRICES</u>	<u>LIST</u>	<u>NET</u>
Package of six c.c. bottles.....	\$1.50	\$.90
20 c.c. bottle.....	2.00	1.20
Package of 4 syringes.....	2.50	1.50

Anti-Distemper and Anti-Influenza Serum (Equine)

For the prevention and cure of all distemper and influenzal conditions in horses and mules.

<u>PRICES</u>	<u>LIST</u>	<u>NET</u>
10 c.c. in syringe container.....	\$1.00	\$.60
50 c.c. bottle.....	2.50	1.50

Navel Ill Mixed Vaccine (Equine)

This vaccine contains all the organisms usually found concerned in navel infection, including B. Abortus Equi.

<u>PRICE</u>	<u>LIST</u>	<u>NET</u>
Package containing six 2 c.c. vials.....	\$1.50	\$.90

Pneumonia Mixed Vaccine (Equine)

Indicated in the treatment of pneumonia, pleurisy, strangles and influenza.

<u>PRICE</u>	<u>LIST</u>	<u>NET</u>
Package of six 2 c.c. vials.....	\$1.50	\$.90

Polyvalent Mixed Bacterin (Equine)

Indicated in the treatment of all suppurative conditions, as well as in influenzal and catarrhal conditions.

<u>PRICE</u>	<u>LIST</u>	<u>NET</u>
Package of 4 syringes.....	\$2.50	\$1.50

The Intradermal Test

IS O. K.

It's Just a Matter of Using the Right Tuberculin
And the Right Tuberculin is Cutter's

Cutter's Intradermal Tuberculin was used in official tests of thousands of dairy cattle in California last year with results more satisfactory than were ever obtained anywhere with any other Tuberculin or any other method of testing.

Try "Cutter's" and verify the certainty of the test and the Tuberculin.

Prices—Intradermal Tuberculin

	<u>LIST</u>	<u>NET</u>
Pkg. containing one 2 c.c. bottle (sufficient for 10 to 20 tests)....	\$.50	\$.30
Pkg. containing four 2 c.c. bottles (sufficient for 40 to 80 tests)...	1.50	.60

Prices—Regular Tuberculin

	<u>LIST</u>	<u>NET</u>
25% Solution (ready for use) 5-dose bottles.....	\$1.00	\$.60
25% Solution (ready for use) 25-dose bottles.....	3.75	2.25
Syringe containing 1 dose ready to use.....	.50	.30

Cutter's Mallein

Is good enough for Uncle Sam. Thousands of doses have been used in testing horses and mules for Army use.

Intrapalpebral Mallein promises to supersede all other forms.
Try it.

If you have testing to do, use "Cutter's" and be on the safe side.
You can bank on accurate results.

<u>PRICE</u>	<u>LIST</u>	<u>NET</u>
Solution (ready for use) 5-dose bottle.....	\$1.00.....	\$.60

For the Ophthalmic Test

<u>PRICE</u>	<u>LIST</u>	<u>NET</u>
Package containing 1 test tablet.....	\$.25	\$.15
Package containing 5 test tablets.....	.50	.30

For the Intrapalpebral Test

<u>PRICE</u>	<u>LIST</u>	<u>NET</u>
Package containing 4 1 c.c.....	\$2.00.....	\$1.20

JANUARY 1, 1920

Note New Net Price

We prepay all Shipping Charges

Order from Berkeley, Calif., or 180 N. Dearborn St., Chicago, Ill.

THE CUTTER LABORATORY

CUTTER'S Canine Distemper Vaccine

Prophylactic

Is a suspension of the B. Bronchisepticus for the prevention of Canine Distemper.

It should be administered in 2 c.c. doses at intervals of from 5 to 7 days.

<u>PRICE</u>	<u>LIST</u>	<u>NET</u>
Three bottles, <u>one immunizing treatment</u>	\$.75	\$.45

CUTTER'S Canine Distemper Vaccine

For Treatment

Is a Mixed Vaccine, containing B. Bronchisepticus, Staphylococcus and B. Coli.

This vaccine has been used with considerable success in the treatment of Canine Distemper. The serum should also be used on valuable dogs.

<u>PRICE</u>	<u>LIST</u>	<u>NET</u>
Six 2 c.c. bottles, in serial dosage.....	\$1.50	\$.90

CUTTER'S Anti-Canine Distemper

Serum

Is especially indicated in the Curative Treatment of Canine Distemper, either alone or in conjunction with the Canine Distemper Vaccine (for Treatment).

The dose is 10 to 50 c.c. according to the size of the dog.

<u>PRICE</u>	<u>LIST</u>	<u>NET</u>
50 c.c. bottle.....	\$2.50	\$1.50

Other Products

Besides the products particularly listed in this issue of the JOURNAL there are a number of other Cutter biologics for the horse, cow, sheep and dog.

Write for new "Therapeutic Index and Price List," and remember that on most of these products you will get straight 40% discount, all shipping charges prepaid.

Dependability

"A good name is rather to be chosen than great riches."

This old text isn't quoted to serve as pious camouflage, for honesty compels us to confess that there are really some sure-enough heathens among us. But it serves better than anything we can think of just now to illustrate the spirit of dependability that more or less unconsciously dominates our whole organization from the most humble worker up.

It has kept us from slighting any step in production, and from rushing on the market with "unseasoned" products. Products that only time could prove of sufficient worth to justify inclusion in the veterinarian's armamentarium.

It has kept us from making extravagant claims regarding the protective values of these new products. But every veterinarian who has had long experience with The Cutter Laboratory products knows that no better biologics are produced and that their special merit lies in their consistent dependability.

This spirit of dependability, and 20 years' experience in conducting high-grade laboratory processes, together with superior location and equipment, guarantee that Cutter products are uniformly the best possible for any laboratory to produce.

Dependability as to quality of products and promptness of service are added assets in your business, if you will let us serve you.

You can use Cutter Bacterial Vaccines in full confidence that high bacterial count is in the vaccine, not on the label; and the same may be said of the organisms represented to be contained in the vaccine. Strains are carefully selected with a view to the greatest polyvalency.

JANUARY 1, 1920

Note New Net Price

We prepay all Shipping Charges

Order from Berkeley, Calif., or 180 N. Dearborn St., Chicago, Ill.

THE CUTTER LABORATORY

Canine Distemper Mixed Bacterin

For prevention and treatment of Canine Distemper, our Bacterial Vaccine, in which we specialize, has some interesting advantages, both in content and pack.

The Moore method is economical and effective and has a long record of success. Detailed information, with prices, upon receipt of your address.

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Biological Laboratories

Palmer, Mass.

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Beebe Bacterial Vaccines are gaining in prestige daily, because the Beebe Laboratories, Inc., have consistently stood for a true bacterial count and therapeutically correct products.

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A distributor in every territory.

These Packages 10c. Per Dose

HEMORRHAGIC SEPTICEMIA VACCINE

(For Cattle, Sheep and Swine)

50 mil Vial	(25 doses)
100 mil Vial	(50 doses)
200 mil Vial	(100 doses)

(Be sure to specify species)

MIXED INFECTION VACCINES

(For Swine and Cattle)

50 mil	(25 doses)
100 mil	(50 doses)
200 mil	(100 doses)

When you administer

BEEBE BIOLOGICS

You know that you have not betrayed your clients' confidence. There is a dealer in every territory. Write us for his name.

BEEBE LABORATORIES, Inc.

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Is a valuable aid to *Veterinarians* in

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NECROBACILLOSIS POWDER

R/1450

Contains Copper Arsenite, Sodium Hyposulphite, Copper Sulphate, Sodium Chloride, Charcoal.

A powder intended for the treatment of the intestinal form of necrobacillosis in swine. It is also of decided value in preventing intestinal fermentation and toxin formation and will prevent the invasion of intestinal parasites.

DOSAGE

From a level to a heaping teaspoonful in sloppy feed twice a day, withholding solid food for 4 to 5 days.

Per 5-lb. carton.....	\$.90
100-lb. can	12.50
20 5-lb. cartons.....	16.00

The Jensen-Salsbury Laboratories

Kansas City

Missouri

Hemorrhagic Septicemia

CATTLE

SHEEP

SWINE

Bovine Hemorrhagic Septicemia Bacterin (Single)

Bio. 788. 20-mil vial (5 doses).

Bio. 789. 100-mil vial (25 doses).

5000 million killed Bact. *bovis* per mil.

Bovine Hemorrhagic Septicemia Vaccine (Double)

Bio. 792. Two 20-mil vials (5 doses each).

Bio. 793. Two 100-mil vials (25 doses each).

Bacterin (killed organisms) and Vaccine (attenuated organisms), both 5000 million per mil.

Porcine Hemorrhagic Septicemia Bacterin (Single)

Bio. 794. 20-mil vial (5 to 10 doses).

Bio. 795. 100-mil vial (25 to 50 doses).

5000 million killed Bact. *suis* per mil.

Porcine Hemorrhagic Septicemia Vaccine (Double)

Bio. 798. Two 20-mil vials (5 to 10 doses each).

Bio. 799. Two 100-mil vials (25 to 50 doses each).

Bacterin (killed organisms) and Vaccine (attenuated organisms), both 5000 million per mil.

Ovine Hemorrhagic Septicemia Bacterin (Single)

Bio. 778. 20-mil vial (5 doses).

Bio. 779. 100-mil vial (25 doses).

5000 million killed Bact. *ovis* per mil.

Ovine Hemorrhagic Septicemia Vaccine (Double)

Bio. 783. Two 20-mil vials (5 to 10 doses each).

Bio. 784. Two 100-mil vials (25 to 50 doses each).

Bacterin (killed organisms) and Vaccine (attenuated organisms), both 5000 million per mil.

Anti-Hemorrhagic Septicemia Serum

Bovine—Bio. 935. 100-mil vials. Ovine—Bio. 945. 100-mil vials.

Porcine—Bio. 940. 100-mil vials.

INDICATIONS

Hemorrhagic Septicemia *Bacterins* are used for both *prophylactic* and *curative* purposes.

Hemorrhagic Septicemia *Vaccines* are recommended for *prophylactic* purposes only. They induce a greater immunizing response than the bacterins.

Anti-Hemorrhagic Septicemia *Serum* is primarily a *curative* agent; but may be used for prophylaxis as well.

SEND FOR LITERATURE

Parke, Davis & Company

DETROIT

